THE PLANT DISEASE REPORTER

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Division of Mycology and Disease Survey

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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

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A NEW VIRUS DISEASE OF CEREALS, TRANSMISSIBLE BY APHIDS

John W. Oswald and Byron R. Houston

A widespread and destructive disease in the 1951 California barley crop was characterized by a brilliant yellowing of the leaves accompanied by moderate to severe stunting of the plants. Investigations to date have revealed that this disease is caused by a virus that is readily transmitted by four different species of grain infesting aphids. This disease is being referred to as yellow-dwarf, a name that closely describes the symptoms on barley.

In mid-April of 1951 much of the barley on the University Farm at Davis and in the surrounding counties of the Sacramento Valley turned yellow within a period of a week. By May 1 practically every barley-producing county in the State had reported a severe yellowing and stunting of this crop. Barley in all stages of growth from the three to four leaf stage through heading was affected and the over-all effect on plant development was closely associated with the stage of growth when the yellowing first occurred. Young plants were either killed or so severely stunted they failed to head. Plants at an intermediate growth stage when the disease appeared became stunted, producing smaller heads and kernels low in test weight. The only apparent effect on plants in the boot or heading stage was a bright yellowing of the flag leaf.

Coincident with the yellow condition on barley was a very abnormal condition in wheat and oats, especially in the late-planted fields. Within a week after yellow-dwarf first appeared in barley, a stunting and chlorosis of wheat and a reddening of oats were observed. In many of the late-planted wheat fields, losses in yields were heavy due to the abundance of stunted, light-green plants, many of which failed to head. All indications were that the wheat and oats were affected by the same factor that was causing yellowing in barley.

The first reaction was that the abnormal condition on all three cereal crops was directly the result of some set of peculiar environmental conditions, probably involving temperature, soil moisture and soil fertility. As the season progressed and more information became available it appeared that environmental factors were not the cause of the disease. First of all, the disease was equally severe in areas with very diverse environmental conditions, both as to amount of winter rainfall and temperature. Soil fertility could hardly be a factor when yellowing of barley invariably expressed itself most vividly on those fields with the heaviest nitrogen fertilization. Further evidence against a climatic factor being responsible was the fact that in all barley fields, no matter how badly affected, normal green plants could always be found scattered among the yellow, dwarfed plants.

Fungus root rots are important in certain of the older grain producing areas of California. The suddenness with which this disease struck and the widespread occurrence seemed to rule out root rot as a cause. Hundreds of isolations from badly diseased barley, wheat, and oat plants yielded no consistent pathogenic fungus.

In 1951 aphid populations on grains, particularly barley, were higher than in many years. The possibility existed that the disease was due to direct aphid injury such as that caused by the green bug, Toxoptera gramineum Rondani (1), in other areas. While this aphid is known to occur in southern California, no collections made in 1951 proved to be the green bug. The fact that yellow-dwarf was severe on barley in areas where aphid populations were not extremely heavy was evidence that if aphids were involved they were more likely to be so in the role of vectors of a virus disease.

TRANSMISSION STUDIES WITH FIELD COLLECTED APHIDS

Colonies of four species of aphids collected on barley during late April, 1951, have been perpetuated on naturally diseased barley and wheat plants transplanted to the greenhouse from the field. The four aphid species, kindly identified for us by Professor E. O. Essig, Division of Entomology, University of California, Berkeley, California, are as follows: corn aphid, Rhopalosiphum (Aphis) maidis (Fitch); apple-grain aphid, Rhopalosiphum prunifoliae (Fitch); grain aphid, Macrosiphum granarium (Kirby); grass aphid, Macrosiphum dirhodum (Walker).

In an experimental plot planted in March 1951, containing some 250 barley varieties which were being tested for root rot resistance, yellow-dwarf damage was extreme and five of the most susceptible varieties (Blackhulless, Goldfoil, C.I. 734, C.I. 754 (Nakano Wase), C.I. 998) were selected to use as test hosts. In addition the common California barley variety Atlas 46, two wheat varieties (Baart 38 and Kanred), and one oat (Ventura) were included in the insect transmission studies reported herein.

Plants were grown in six-inch pots and thinned to five per pot. At the two-leaf stage approxi-

mately ten insects that had been reared on naturally diseased plants were placed on each seedling. The pot was then caged for three days, after which the aphids were removed by insecticidal spray. For check plants, pots were caged with no aphids for the same period of time and then sprayed in the same manner as the inoculated pots.

The results of several inoculation trials involving the four grain-infesting aphids are condensed in Table 1.

Table 1. Transmission of barley yellow-dwarf virus by four species of field collected aphids.

Host Plants	Aphid species								Non-inoculated	
	Rhopalosiphum prunifoliae		Rhopalosiphum maidis		Macrosiphum granarium		Macrosiphum dirhodum			
	No. of plants		No. of plants		No. of plants		No. of plants		No. of plants	No. infect.
	Inoc.	Infect.	Inoc.	Infect.	Inoc.	Infect.	Inoc.	Infect.		
Barley										
Atlas 46	60	37	30	4	31	23	35	9	60	2
Blackhulless	25	25	10	10	15	14	10	6	30	0
Goldfoil	5	4	10	10	10	10	--	--	20	0
C.I. 734	30	30	10	10	10	9	3	1	30	0
C.I. 754	10	3	5	5	10	10	--	--	25	0
C.I. 998	14	13	10	9	14	13	2	2	25	0
Wheat										
Baart 38	20	20	--	--	--	--	15	0	40	0
Kanred	--	--	9	8	10	10	3	0	20	0
Oats										
Ventura	20	20	30	15	10	8	3	1	50	1
Totals	184	152	114	71	110	97	71	19	300	3
Percent transmission	82.6		62.2		88.2		26.8		1.0	

The data demonstrate that the yellowing condition in barley is attributable to a virus and that all four aphids listed are vectors of the virus. In tests to date, the yellow-dwarf virus has been transferred from both barley and wheat to all three cereals. Symptoms of the disease in a given variety are identical regardless of the source of the virus and in all instances were like those appearing in the field this past season.

Ten days after inoculation, plants of the barley variety Blackhulless are noticeably more stunted than the non-inoculated checks, and within three weeks are less than one-half the size of the checks (Fig. 1, A). The green color of the older leaves is darker than normal, almost greenish-black, whereas the new stunted leaves are yellow at the tip and along the margins. Yellow-dwarf in the barley variety C.I. 998 is characterized by brilliant yellowing of the leaves starting at the tip, extending down the margins and soon enveloping entire leaves (Fig. 1, B). The newer leaves show a striping, the tissues over the veins remaining green and the interveinal tissues becoming chlorotic. In Atlas 46 the disease appears first as a yellowing of the leaf tips followed by the occurrence of irregular yellow blotches on most of the lower leaves.

Inoculated wheat plants are one-half to three-fourths the size of the non-inoculated plants at heading. The variety Baart 38 was severely affected in the field this past season, and inoculation by aphids reared on diseased barley resulted in the same stunting and light green chlorotic condition of the wheat plants as was seen in the field. Tests thus far have shown the Kanred variety to be more tolerant, but inoculated plants are definitely dwarfed.

The first evidence of the yellow-dwarf disease in the oat variety Ventura is the development of irregular yellowish-green blotches on the older leaves principally near the tips. These spots later take on a reddish cast and eventually the leaf tip and often the entire leaf becomes reddish-brown in color. Associated with this discoloration is extreme dwarfing -- less than half the size of normal plants -- and a longitudinal chlorotic striping of the new leaves (Fig. 1, C).

FIGURE 1. Aphid transmission of barley yellow-dwarf virus. Pictures taken five weeks after a three-day period of aphid feeding.

A. Blackhulless barley: on left, plants inoculated with viruliferous corn aphids (Rhopalosiphum maidis); on right, with viruliferous grain aphids (Macrosiphum granarium); center, non-inoculated checks of the same age.

B. Barley (C.I. 998): on left, plants inoculated with viruliferous grain aphids (M. granarium); on right, plants on which non-viruliferous grain aphids were fed.

C. Ventura oats inoculated same as in B.

TRANSMISSION STUDIES USING NON-VIRULIFEROUS APHIDS

In the first transmission experiments described above, aphids known to be non-infective were not available for use on check plants. To obtain colonies of these, winged adults were placed in small vials containing moistened filter paper and capped with cheese cloth. Within a day many nymphs were present in the vials and these were transferred by camels-hair brush to barley seedlings that had been caged since emergence. The colonies originating from nymphs that had never fed on diseased plants proved to be non-viruliferous. In this manner virus-free colonies of each of the four aphid species were developed.

Non-infective aphids of each species were reared upon diseased plants for a week. Then, as described above, ten aphids were caged on each seedling for a period of three days before removal with insecticidal spray. A parallel series with non-infective aphids was carried out at the same time. The results (Table 2) substantiate the fact that all four aphid species are vectors of the yellow-dwarf virus, and further that non-infective aphids in this short feeding period have no effect upon normal plant growth.

Table 2. Transmission studies of the barley yellow-dwarf virus utilizing non-viruliferous colonies of four species of aphids.

Aphid species	Viruliferous Aphids		Non-viruliferous Aphids	
	Number barley seedlings		Number barley seedlings	
	Caged with aphids	Developing yellow-dwarf	Caged with aphids	Developing yellow-dwarf
Rhopalosiphum prunifoliae	40	40	15	0
Rhopalosiphum maidis	20	20	10	0
Macrosiphum granarium	40	32	15	0
Macrosiphum dirhodum	35	12	10	0

FAILURE TO TRANSMIT YELLOW-DWARF MECHANICALLY

To date all attempts to transmit the yellow-dwarf disease by using expressed plant juice and carborundum have been negative or inconclusive. Juice extracted from a number of naturally diseased barley, wheat, and oat plants and applied to seedlings of known susceptible barley varieties has failed in all instances to induce the disease. Likewise, attempts to transmit mechanically from typically diseased barley plants that had been infected by aphids have been unsuccessful. In a few isolated cases, mechanically inoculated barley plants have subsequently become diseased. Approximately the same percentage of non-inoculated checks, however, have also developed yellow-dwarf (Table 1). Despite a regular spray program in the greenhouse, occasional aphids appear and these probably account for the small percentage of infection in the check plants. Evidence accumulated thus far shows the yellow-dwarf virus is not mechanically transmissible or, if so, only with extreme difficulty.

CONCLUSIONS

Barley yellow-dwarf seems to differ from all heretofore reported virus diseases of cereals (3, 4, 5, 6) in three principal respects: 1), the symptoms are more of a "yellows type" virus rather than a mosaic -- no mosaic mottle being associated with this disease; 2), the virus is not mechanically transmissible; and 3), most significant is the ease with which the yellow-dwarf virus is transmitted by aphids. The four species of grain aphids tested all proved to be vectors and it is not unlikely that others will be found. The only report of aphid transmission of a cereal virus is that of Atkinson (2) who reports western wheat mosaic virus transmitted by the aphid Toxoptera gramineum.

The disease is not new in California. Scattered individual barley plants resembling yellow-dwarf have definitely been observed in the past but no attempt has ever been made to determine the cause. Why the disease reached epiphytotic proportions in 1951 is not fully understood. Un-

questionably the abnormally large population of aphids of several species on grain crops last year partly accounts for the widespread occurrence of the disease. Large flights of aphids were common in March, 1951, in the Sacramento Valley and were probably responsible for the sudden development of yellow-dwarf over a wide area within a few days in mid-April. The abundance of aphids in March, when the barley and other cereals were for the most part very young (due to unusually late-planting in 1951), undoubtedly made the damage from the disease more acute. The host plants that serve as a reservoir of the virus for the aphids during the summer and early fall must be determined before the disease cycle can be understood.

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SUSCEPTIBILITY AND RESISTANCE TO THE WHEAT STREAK-MOSAIC VIRUS IN THE GENERA TRITICUM, AGROPYRON, SECALE, AND CERTAIN HYBRIDS

H. H. McKinney and W. J. Sando

Introduction

Although wheat varieties differ somewhat in the degree to which they express streak mosaic (3), no outstanding resistance has yet been observed among more than 100 varieties or lines when the plants were inoculated with the yellow streak-mosaic virus by manual methods. Because of the failure to find resistance among the commercial wheats tested, it seemed advisable to explore several species of Triticum, Agropyron, and Secale, and certain hybrids between them. The experiments reported here were conducted in the greenhouse at Beltsville, Maryland, or at Arlington, Virginia.

Methods

The plants were grown in pots or boxes. Unless indicated otherwise, from 12 to 36 plants of each species and variety were tested. Varying numbers of plants of hybrid selections were tested. Seedlings with three to four leaves were inoculated with the virus of wheat yellow streak-mosaic (Marmor virgatum McK.), by wiping or spraying, by methods already described (2, 4).

In the tests of hybrids, most of the plants failing to express mosaic after the first inoculation were inoculated again. Wheat, usually Michigan Amber, was used in each test as a control on the activity of the virus, the inoculation method, and the culture conditions. With rare exceptions, mosaic developed in all control plants after one inoculation.

Results with Species

In Table 1 it will be observed that 13 of the 14 species of Triticum tested expressed mosaic in all of the inoculated seedlings. In T. dicoccum (white emmer) 7 percent of the seedlings were free of mosaic. None of the 17 species of Agropyron listed in Table 2 expressed mosaic but a few showed local lesions. No systemic virus has yet been detected in any of the Agropyron species tested.

The genus Secale showed high resistance or immunity. Resistance was very high in all of the commercial varieties of rye listed in Table 3.

Table 1. Results from manual inoculation tests with the wheat yellow streak-mosaic virus in species and varieties in the genus Triticum.

Species and Varieties	Mosaic (percent)
Triticum aegilopoides (Link) Bal.	100
T. aestivum L.	100
T. dicoccoides Koern.	100
T. dicoccoides var. strausianum Schulz	100
T. dicoccum Schrank (Black Winter emmer)	100
T. dicoccum (White emmer)	93
T. dicoccum (Yaroslav emmer)	100
T. durum Desf. (several varieties)	100
T. monococcum L. (einkorn)	100
T. monococcum var. flavescens Koern.	100
T. monococcum var. laetissimum Koern.	100
T. orientale Perciv.	100
T. persicum var. stramineum Zhukov.	100
T. polonicum L. (White Polish wheat)	100
T. spelta L. (Red Winter spelt)	100
T. sphaerococcum Perciv.	100
T. turgidum L. (Alaska poulard wheat)	100
T. timopheevi (Zhukov.) Zhukov.	100

Table 2. Results from manual inoculation tests with the wheat yellow streak-mosaic virus on species in the genus Agropyron.

Species[a]	No. or Source	Plant Reactions: Mosaic	Plant Reactions: Local Lesions[b]
Agropyron amurense Drobov.	P 9838, Comstock	0	0
A. cristatum (L.) Gaertn.	Sando	0	0
A. dasystachyum (Hook.) Scribn.	1949-42, Comstock	0	0
A. divaricatum Boiss. et Bal.	FPI 119 602	0	0
A. elongatum (Host) Beauv.	Sando	0	-
A. elongatum	P 5330, Comstock	0	5/15
A. intermedium (Host) Beauv.	P 2327, do.	0	4/19
A. lasianthum Boiss.	1948-75, do.	0	20/20
A. pungens (Pers.) R. et S.	48-36, do.	0	6/22
A. repens (L.) Beauv.	Field Collection	0	0
A. semicostatum (Steud.) Nees	3065-37P, Comstock	0	0
A. sibiricum (Willd.) Beauv.	48-83, do.	0	0
A. spicatum (Pursh) Scribn.	P 737, do.	0	0
A. trachycaulum (Link) Malte	P 2535, do.	0	2/22
A. trachycaulum	P 8039, do.	0	0
A. ugamicum Drobov.	48-76, do.	0	4/14

[a]Populations ranged from 12 to 36 plants.
[b]The numerator indicates the number of plants expressing lesions, and the denominator the number of plants inoculated.

Table 3. Results from manual inoculations with the wheat yellow streak-mosaic virus on species and varieties in the genus Secale.

Species, subspecies, and varieties	Source	Date of Test	No. of Plants	No. Plants Mosaic
Secale cereale L. subsp. ancestrale Zhuk.	W. J. Sando	1/24/39	1	1
S. cereale L. (rye)				
var. Balbo	Michigan State	1/18/50	8	5
2nd inoc.	College	2/13/50	5	0
var. Rosen	do.	1/18/50	11	0
2nd inoc.		2/13/50	11	0
var. So. Dakota 44-1	do.	1/18/50	9	1
2nd inoc.		2/13/50	8	1
Var Star	J. W. Taylor	1/14/38	12	0
2nd inoc.		3/1/38	12	0
3rd inoc.		4/5/38	12	0
Star	do.	10/10/49	65	0
S. montanum Guss.	W. J. Sando	3/6/39	2	0
S. montanum	V. E. Comstock	3/20/50	16	1

Results with Hybrids

Owing to the known difficulties involved in fixing rye genes in wheat, emphasis has been placed on the testing of selections from hybrids between wheat and Agropyron species.

During the winter of 1949-50, 50 selections from hybrids involving commercial wheats crossed with several species of Triticum, Agropyron, Aegilops, and Secale were tested. Populations ranged from 7 to 18 plants per selection. The culture temperature after inoculation was near 70°F.

One-half of the selections showed no resistance to mosaic. The remaining 25 expressed mild mosaic or no mosaic in some or all of the plants. Twelve of the selections seemed to be rather uniformly resistant. Sixteen of the 25 selections showing the higher resistance carried genes from Agropyron elongatum.

Eight of the more resistant selections were retested in a shaded greenhouse during the summer. The seedlings were inoculated September 15, 1950. In this test, two of the selections developed strong yellow mosaic in all of the plants. The remaining resistant plants were inoculated again on September 22, and culture was continued in a shaded greenhouse. In this test, one more selection developed strong yellow mosaic in all of the plants, and another developed mild mosaic in all of the plants. In two selections, some of the plants were mosaic-free, and part had mild mosaic. All of the plants of the other two selections were free of mosaic.

During the winter of 1950-51, 64 selections from Agropyron by wheat hybrids, chiefly A. elongatum hybrids, were inoculated in the seedling stage, and cultured near 70°F. Plant populations ranged from 1 to 9 per selection. Plants that failed to develop mosaic were reinoculated 10 days later. After the second inoculation, 28 of the selections gave no evidence of resistance, 28 others had mild mosaic or no mosaic in parts or all of the populations, whereas 8 were free of mosaic in all of the plants.

Another lot of 20 selections from wheat by Agropyron hybrids carrying genes of Agropyron elongatum were supplied by E. G. Heyne of the Kansas Agricultural Experiment Station. The original crosses from which some of these selections were obtained had been made by W. J. Sando. Seedlings of this material were inoculated during the winter of 1950-51, and cultured near 70°F. Plant populations ranged from 17 to 24 per selection. One selection gave no sign of resistance, 13 had mild mosaic or no mosaic in some of the plants, whereas, 6 were free of mosaic. The mosaic-free plants were reinoculated 17 days after the first inoculation. After this inoculation, 10 selections developed mosaic in all or nearly all of the plants that failed to become infected from the first inoculation; whereas, 5 of the 6 that were mosaic-free after the first inoculation, remained free after the second inoculation. However, many but not all of these plants developed local lesions on the wiped or sprayed leaves.

Discussion

It appears that failure to express mosaic after one inoculation of the seedlings in these tests, indicates weak resistance. This was indicated in tests with barley inoculated with streak-mosaic virus (3). Some of the Chinese wheats have given signs of the same type of resistance. The field value of this reaction is not known.

Plants expressing local lesions only may possess high resistance to mosaic in the field, but this manifestation requires further study. It is known that the control value of the local lesion reaction in some plant species depends on the genotype, and on the environmental conditions, particularly temperature (1).

It is noteworthy that some plants from Agropyron-wheat hybrids in these tests failed to develop local lesions or mosaic after two inoculations. All of the selections that have shown high mosaic resistance or possible immunity will require many additional crosses with wheat before desirable commercial wheats can be obtained.

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SEEDLING RESISTANCE VS. ADULT-PLANT SUSCEPTIBILITY OF MENTANA WHEAT TO RACE 15B OF PUCCINIA GRAMINIS TRITICI

Conley V. Lowther

It is recognized that certain varieties of wheat are susceptible to stem rust (Puccinia graminis tritici Eriks. & E. Henn.) in the seedling stage but become resistant as they approach matur-

Table 1. Seedling vs. adult-plant reactions of wheats to race 15B of Puccinia graminis tritici in the greenhouse at Beltsville, Md., in 1950-1951.

Entry No.	Variety or Cross	C. I. or Sel. No.	Reaction to 15B	
			Seedling	Adult
6	Thatcher	C. I. 10003	4	4
255	Egypt Na 101	C. I. 12100	0;-1	0;-1
1028	Rushmore^2-Supresa	PW 207	4	1
20	Mentana	C. I. 12448	1$^+$	4
D,47	Kenya, C9906	C. I. 12882	0;-1	0;-1
B54	Kenya-Mentana	II 56-8c-17c-2c-13c	0;	0:-1
B71	Mentana^2-Kenya	II-460-1c-1c-1c-15c	0;-1	1$^+$
B35	Kenya-Mentana	II-56-8c-11c-2c-12c	0;-1‡	3
B82	"	II-56-8c-17c-1c-25c	0;-1	4
B254	"	II-56-8c-17c-1c-87c	0;-1	4
B1007	Mentana-Kenya	II-35-6c-(1-6)c-7c	0;-1‡	4
B1008	"	II-35-6c-2c-(1-6)c-7c	"	4
B1009	"	II-35-6c-2c-(1-6)c-8c	"	4
B26	Mentana^2-Kenya	II-459-3c-2c-1L-1L-1L-2c	"	4
B239	"	II-461-2c-4c-1c-1y-2c	0;-1	4
B245	"	II-460-1c-1c-1c-1c-1c-21c	0;-1‡	3
B1112	"	CR-II-460-1c-1c-1c-1c-2c	0;-1	3
B1127	"	CR-II-460-1c-1c-1c-1c-31c	0;	3-4
B1129	"	CR-II-460-1c-1c-1c-1c-34R	0;	3
B1133	"	II-463-6y-3c-3c-2c	0;	4
B1139	"	II-463-6y-3c-3c-18c	0;	3
B1141	"	II-463-6y-3c-3c-26c	0;-1	4
B1142	"	II-463-6y-3c-3c-26c	0;	3
B78	Mentana^3-Kenya	II-461-5L-6L-20c	0;-1	4
B240	"	II-461-6L-1L-3L-16R	0;-1‡	4

ity (1, 2, 3, 4, 5, 6). To the writer's knowledge, the reverse of this reaction, i.e., seedling resistance and adult-plant susceptibility, has not been clearly demonstrated. Hence, workers have assumed that varieties or hybrids resistant to a particular rust in the seedling stage probably would be resistant to that rust in the adult stage (1). On this assumption many lines have been in breeding for rust resistance after they were found to have seedling resistance in greenhouse tests. The results of tests conducted in the greenhouse at Beltsville, Maryland, during the winter of 1950-51 prove that this assumption is not always valid.

Approximately 4,000 wheats were inoculated in the first and second leaf stage to test for seedling reaction to race 15B of Puccinia graminis tritici. Plants from about 50 percent of these lines were reinoculated in the boot stage to test for adult-plant reaction. Temperatures during both tests were maintained at 70°to 75°F. The 15B used in all of these tests was provided by Dr. E. C. Stakman from a collection made at Brookings, South Dakota, in 1950.

Plants from a majority of the lines that were carried to maturity were either susceptible or resistant in both the seedling and adult stages of plant growth. Several lines were susceptible as seedlings but resistant as mature plants. An unusual response was found in the Mentana variety and some of its progeny, in that the seedlings were resistant, whereas the adult plants were completely susceptible. Varieties or hybrids showing the four types of seedling versus adult-plant reactions are listed in Table 1. Most of those listed are of the unusual type.

The 4,000 wheats tested included 134 lines of crosses between Mentana (C. I. 12448) and Kenya (C. I. 12882, C9906)[1]. Thirty-four of these were susceptible in the seedling stage and were not tested further. Of the remaining 100 lines[2], 38 were resistant in both stages and 62 were resistant in the seedling stage but susceptible as mature plants. A 1+ type reaction developed on Mentana in the seedling but a type 4 in the adult plant. The pustule type on Kenya was classed as 0;-1 at both stages of plant growth.

During July and August 1951, the greenhouse temperature usually was above 100°F. for a part of each day. Several series of Mentana seedlings were inoculated with 15B to determine the reactions at these high temperatures coupled with long light periods. Under these conditions Mentana was less resistant than it had been under winter greenhouse conditions. Twelve to fourteen days after inoculation at such high temperatures the pustules were still very small with chlorotic areas surrounding them, but there was no necrosis. Twenty-one days after inoculation many of the pustules were of a type 2. Similar reactions were obtained when stem rust race 56 was used.

To the writer's knowledge this is the first clear-cut case reported of a wheat variety having seedling resistance and adult-plant susceptibility to stem rust. This situation makes testing for stem rust resistance more complicated whenever the Mentana variety is involved.

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[1]The crosses were made and seed of them furnished by Dr. N. E. Borlaug of the Rockefeller Foundation in Mexico.

[2]There were 52 simple crosses, 45 backcrosses of Mentana^2 x Kenya, and 3 backcrosses of Mentana^3 x Kenya.

REACTION OF CEREAL VARIETIES TO SMUTS IN ALASKA

S. C. Litzenberger

The barley, oat and wheat varieties included in the Alaska Station yield trials at Palmer and College in 1950 and 1951 were inoculated with their respective smuts, Ustilago hordei (Pers.) Lagerh, U. kolleri Wille and U. avenae (Pers.) Rostr., Tilletia caries (DC.) Tul. and T.

Table 1. Reaction of spring barley varieties to covered smut, Ustilago hordei, collected in Alaska, Matanuska Station, Palmer, Alaska, 1950-1951.

Variety	Alaska Cereal Accession No.	U.S.D.A. Cereal Investigation No.	Percent heads smutted 1950	1951	Averages for years tested
Alaska Black	328	-	-	0.0	0.0
Machine Barley	77	4982	-	0.0	0.0
Himalaya*	805	1312	-	0.0	0.0
Pannier*	808	1330	-	0.0	0.0
Velvon 11	326	7088	0.7	-	0.7
Olli**	43	6251	0.0	1.7	0.9
Swedish Star	110	1701	-	0.9	0.9
Balder	139	7131	2.0	0.0	1.0
Shaw	329	5067	-	2.0	2.0
Maja	62	7128	-	2.0	2.0
Markhinetz (Thompson Swedish Hulless)**	327	2512	0.7	3.2	2.0
Markinetz (Siberian 6)**	17	7279	1.0	3.2	2.1
Danish Gold	50	1391	-	3.0	3.0
Asplund	71	2533	-	3.4	3.4
Opal B	138	6617	-	3.5	3.5
Siberian 13	178	8913	-	3.7	3.7
Warrior	6	6991	-	4.0	4.0
Moore	173	7251	-	5.2	5.2
Asplund (Poplar Grove)	136	6558	-	5.2	5.2
Abed Binder	52	1879	-	5.9	5.9
Asplund	133	4981	-	6.0	6.0
Stella	41	2678	6.3	6.4	6.4
Edda**	19	7129	9.3	4.7	7.0
Tammi	32	8345	2.7	12.0	7.4
Coeleste (Siberian 14)	34	8914	5.0	14.6	9.8
Lapin	27	6427	13.7	-	13.7
Opdal	39	2532	14.3	-	14.3
Freja	10	7130	30.0	2.1	16.1
Excelsior*	806	1248	-	16.7	16.7
Lion*	807	923	-	17.5	17.5
Dore	38	6553	21.3	15.2	18.3
Trapmar**	12	7506	11.3	26.0	18.7
Flöya	372	-	-	19.7	19.7
Polarbyg	16	6556	20.0	-	20.0
Nepal*	804	595	-	20.2	20.2
Narym 0-41 (Siberian 21)	26	8920	24.7	-	24.7
Edda II	325	(P.I. 188831)	37.7	20.1	28.9
Fenia	20	3555	29.7	-	29.7
Trebi*	803	936	-	39.4	39.4
Pioneer	91	7280	45.0	-	45.0
Hannchen*	801	531	-	45.1	45.1
Krosnoyarski	97	7314	45.7	-	45.7
Odessa*	802	934	-	51.3	51.3

*Physiologic race tester varieties used by Dr. V. F. Tapke, U.S.D.A., Beltsville, Md.
**Varieties currently recommended and grown in Alaska.

Table 2. Reaction of spring oat varieties to oat smuts, Ustilago kolleri and U. avenae, collected in Alaska, Matanuska Station, Palmer, Alaska, 1950-1951.

Variety	Alaska Cereal Accession No.	U.S.D.A. Cereal Investigation No.	Percent panicles smutted 1950	1951	Averages for years tested
Vicland	310	3611	0.0	0.0	0.0
Goldwin	195	4237	0.0	0.0	0.0
Overland	234	4181	0.0	-	0.0
Cherokee	184	3846	0.0	-	0.0
Mission	321	2599	1.3	0.8	1.1
Fortune	208	5226	-	1.5	1.5
Abegweit	181	4970	0.0	4.6	2.3
Gopher*	204	2027	1.0	4.2	2.6
Larain	224	4611	2.3	2.9	2.6
Exeter	213	4158	-	5.7	5.7
Ajax	205	4157	1.7	16.4	9.1
Bridger	188	2611	4.7	21.0	12.9
Tammi	192	5041	15.3	-	15.3
Beaver	202	4521	4.0	27.3	15.7
Ithacan	197	2141	10.0	23.2	16.6
Eagle	222	4113	11.3	22.7	17.0
Golden Rain 5	200	-	10.7	28.0	19.4
Colorado 37	193	1640	16.7	24.5	20.6
Golden Rain (Siberian 3)*	189	4794	19.7	24.6	22.2
Mayan 044 (Siberian 4)	196	4795	23.0	41.6	32.3
Siberian U3-47	251	-	-	32.6	32.6
Climax*	190	5335	20.3	50.6	35.5
Victory*	199	1145	17.3	55.2	36.6
Siberian 2-47	247	-	-	38.7	38.7
Swedish Select	203	213	28.7	56.0	41.4
Marvelous	182	1999	30.7	52.2	41.5
Kyto	187	4513	22.0	65.6	43.8
Echo	198	1982	22.3	67.8	45.1
Kjuto (Siberian 1)	186	4792	31.3	65.5	48.4

Table 3. Reaction of spring wheat varieties to covered smut or bunt, Tilletia caries and T. foetida, collected in Alaska, Matanuska Station, Palmer, Alaska, 1950-1951.

Variety	Alaska Cereal Accession No.	U.S.D.A. Cereal Investigation No.	Percent heads smutted 1950	1951	Averages for years tested
Lee	796	12488	---	17.1	17.1
Thatcher	265	10003	---	28.7	28.7
Garnet	274	8181	30.0	---	30.0
Saunders	298	12567	---	33.4	33.4
Narym 3 (Siberian 10)	264	(P.I. 182532)	21.7	48.2	35.0
Narym 5 (Siberian 11)	269	(P.I. 182533)	---	39.0	39.0
Red Bobs	301	6255	40.0	47.1	43.6
Siberian 12	257	(P.I. 182534)	20.0	70.3	45.2
Red Bobs-Romanov-Garnet-Romanov x Khogot**	268	----	51.7	49.0	50.4
Ceres	322	6900	71.7	29.6	50.7
Pika x Khogot**	275	----	45.0	57.5	51.3
Tammi	277	(P.I. 181473)	58.3	49.3	53.8
Diamond x Khogot**	278	----	55.0	57.5	56.3
Victory (Siberian 4)	323	(P.I. 182528)	60.0	56.9	58.5
Ferrugineum sibiricum (F-47)	279	----	53.3	67.4	60.4
Wisconsin Wonder x Reward**	260	----	80.0	53.7	66.9
Red Bobs x Rumanian**	295	----	68.0	---	68.0
Khogot*	261	----	63.3	73.0	68.2
Early Finnish (Siberian 13)	271	(P.I. 182535)	76.7	70.0	73.0
Skorospielka (Siberian 1)	267	(P.I. 182525)	93.0	67.3	80.2

*Varieties currently recommended and grown in Alaska. **Advanced generation bulk hybrids

foetida (Wallr.) Liro. These smuts were collected in 1949 from grain grown by farmers in the Matanuska and Tanana Valleys. Khogot wheat, Trapmar barley, and Victory and Swedish Select oats, all susceptible varieties, were the prevailing cereals grown at the time. No race identification has been made on the smuts used as a source of inoculum.

Inoculation, except for the barleys in 1951, was by dusting the seeds with an abundance of spores. The oats and the 1950 barleys were dehulled by hand to encourage infection. In 1951 Tapke's[1] method of infecting barley with U. hordei was used. Smut counts were made in triplicated nursery plots. Row lengths in 1950 and 1951 were 5 and 8 feet, respectively.

Results of the 1950 and 1951 cereal smut tests at the Matanuska Station are presented in Tables 1, 2, and 3. The varietal reactions to the smuts are listed in order of average infection. Very satisfactory differential reactions were obtained during both years of the test. Varietal responses to the smuts collected and tested under Alaskan conditions did not differ essentially from those reported for certain of the same varieties tested in other spring cereal growing areas.

Average infection percentages ranged from 0 for the most resistant strains (Alaska Black, Machine Barley, Himalaya and Pannier barleys and Vicland, Goldwin, Overland and Cherokee oats) to 51.3 percent for Odessa barley, 48.4 for Kjuto oats, and 80.2 for Skorospielka wheat.

Lee, the most resistant variety of wheat, averaged 17.1 percent of infected heads. Twenty-three of the 44 barleys in the test, including Olli, Markhinetz, and Edda, which are recommended for growing in Alaska, had averages of 7 percent or less. It is evident that there are adequate sources of covered smut resistance to the races now prevalent in the barley growing area of the Territory for use in barley improvement.

In addition to the four oat varieties that showed no smut infection, Mission, Fortune, Gopher and Larain averaged less than 3 percent. Of these, only Gopher is recommended for growing in Alaska. The other smut-resistant varieties are either too late in maturing or too low yielding. The Golden Rain variety of oats possesses the best available combination of grain yield, earliness, and straw strength for growing in Alaska, although it is susceptible to smut. The Golden Rain and Climax varieties were crossed with Vicland, Cherokee or Eaton in 1951 to obtain adapted early maturing smut-resistant varieties.

All wheat varieties showed relatively heavy infection from the Alaskan bunt collection. Further exploration is necessary to locate sources of resistance for use in wheat improvement. Increased earliness in wheat is more important than bunt resistance at the present time. Varieties earlier than Khogot are needed.

CEREAL INVESTIGATIONS, AGRONOMY DEPARTMENT, ALASKA AGRICULTURAL EXPERIMENT STATION, PALMER, ALASKA

[1]Tapke, V.F. New physiologic races of Ustilago hordei. Phytopath. 35: 970-976. 1945.

CEREAL SEED-TREATMENT RESULTS (ADDITIONS AND CORRECTIONS)[1]

R. W. Leukel

In the seed-treatment results reported in the October 15 Plant Disease Reporter, the data from Dr. M. B. Moore arrived too late to be included with those from the other stations. He obtained no data of value from the Moore and Atlas barleys, but very interesting results from Ulka wheat (bunt control) and Canadian oats (smut control). His data, here summarized, should be compared with the data on pages 445-451 in the October 1951 issue of the Plant Disease Reporter.

Table 1. Control of bunt in Ulka wheat and smuts in Canadian oats, planted in triplicated 6-foot rows, 200 seeds per row, planted May 4 and May 10, 1951, respectively, at University Farm, St. Paul, Minn.

Treatment [a]			Percent smut in -	
No.	Name	Rate o.p.b.	wheat	oats
1.	Check	---	63.5	19.2
2.	Ceresan M	1/2	0.7	0
3.	Aagrano	1/2	2.3	0.3
4.	Agrox	1/2	4.4	1.0
5.	L-224	1/2	7.3	8.2
6.	Dynacide	1/2	13.3	0.5
7.	Leytosan	1/2	6.4	2.0
8.	K. F. 467[b]	1/2	0.4	2.0
9.	Mercuran A. S.	1/2	3.1	0
10.	Ceresan M sl.	1/2	0	0
11.	Aagrano sl.	1/2	0	0
12.	Panogen, conc.	3/4	0	1.0
13.	Check	---	66.5	---
14.	Panogen, dil.	3/4	0.1	0
15.	Mercuran A.L.	1/2	0.2	5.5
16.	Vancide 51	4	1.3	---
17.	Arasan	1	2.6	---
18.	$CuCO_3$	2	0.6	---
19.	Phygon	1	2.2	---
20.	Spergon	1	0.6	---
21.	C & C 640	1	0.3	---
22.	" 5400	1	1.3	---
23.	Parson's	1/2	44.3	---
24.	Anticarie	1/2	3.6	---

[a] Numbers 2 to 9 and 17 to 24 inclusive were applied as dusts; numbers 10 to 11 as slurries; numbers 12, 14, 15 and 16 as solutions.

[b] K.F. 467 was compounded originally by Koppers Company, Pittsburgh, Pa., and submitted for preliminary testing to Dr. J. W. Heuberger, Plant Pathology Department, University of Delaware, from whom the sample used in these cooperative tests was obtained. In the October Reporter it was intimated that K.F. 467 was originally produced by Rohm and Haas.

In the October number of the Reporter, the statement was made that Panogen can be diluted with water and applied effectively in a slurry treater. The data show that when applied in this manner, Panogen lost none of its effectiveness. Attention is called to a similar statement made by Drs. Benjamin Koehler and W. M. Bever of the University of Illinois.[2] They state: "Tests showed that Panogen could be applied equally well or perhaps better with a regular slurry machine."

[1] See Plant Disease Reporter 35 (10): 445-451. Oct. 15, 1951

[2] Koehler, Benjamin and Bever, W. M. 1951. A new seed treatment for disease control. Ill. Agr. Expt. Sta. (Unnumb. Mimeo. Leaflet), 1 p. Sept. 4, 1951.

Bunt Control in Winter Wheat
(From the experiments of Dr. C. S. Holton)

In an experiment on bunt control in winter wheat at Pullman, Washington, during the 1950-51 season, Dr. C. S. Holton reports that he tried eight materials, three of which were applied in both dust and slurry forms (Table 2). With an average of 68 percent infection in the checks, only one treatment (C & C 5837) failed to reduce infection to less than 2 percent, while five treatments eliminated bunt completely -- Agrox slurry, F.W.P.F.C. dust, Mergamma dust and slurry, and Anticarie dust. The perfect control of bunt obtained with the non-mercurial, Anticarie (hexachlorobenzene), while four of the more or less standard mercurials failed to eliminate infection, is the most outstanding feature of the experiment. One shortcoming of Anticarie, according to Dr. Holton, is the fact that in its present form it cannot be applied as a slurry. Dr. Holton reports that in the Pacific Northwest, dust treatments are being abandoned in favor of the slurry or quick-wet treatments. He states that the "one thing needed most in seed-treating slurries is a sticker to hold the dust on after the water evaporates." The alternative to this, he states, is a treatment applied as a solution.

Table 2. Bunt control in Triumph winter wheat grown from inoculated seed, treated as shown, and planted in rod-rows replicated four times at Pullman, Washington, 1950-51

Seed Treatment Used				
No.	Name	Form	Rate o.p.b.	Average percent smut
1.	Check[a]	----	----	68.0
2.	Ceresan M	Dust	1/2	1.5
3.	Panogen 1.4 %	Liquid	3/4	0.5
4.	Panogen 1.7 %	Liquid	3/4	1.0
5.	Panogen 2.0 %	Liquid	3/4	1.5
6.	N. I. Ceresan	Dust	1/2	0.5
7.	Agrox	Dust	1/2	0.5
8.	Agrox	Slurry	1/2	0
9.	F.W.P.F.C.[b]	Dust	1/2	0
10.	F.W.P.F.C.	Slurry	1/2	1.2
11.	Mergamma	Dust	1/2	0
12.	Mergamma	Slurry	1/2	0
13.	Anticarie	Dust	1/2	0
14.	C & C 5837[c]	Dust	1/2	17.5

[a]Average of 8 replications; infection ranged from 34 to 83 percent.
[b]"Plant Fungi Control F.W."; composition not given.
[c]Active ingredient dibromo butene.

DIVISION OF CEREAL CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, AGRICULTURAL RESEARCH ADMINISTRATION, U. S. DEPARTMENT OF AGRICULTURE.

A REPORT ON THE INFLUENCE OF SPRAY ADDITIVES ON CONTROL OF HELMINTHOSPORIUM TURCICUM PASS. IN THE EVERGLADES

Warren N. Stoner

The 1949-50 investigations for control of Helminthosporium leaf blight of sweet corn indicated that some fungicides did give experimental control of the disease[1]. These experiments in 1949-50 were conducted with the materials alone. The question of what effect the so-called spreader-stickers would have if added to these spray mixtures has arisen. The spray trials of the 1950-51 season included an experiment to try to determine this point.

The experiments were conducted on a plot layout of a 4 x 4 latin square. Each plot consisted of 6 rows 18 feet long planted on 32 inch centers 8 inches in the drill. Twenty foot alleyways were used between plots each way. Three materials were used: p.e.p.s. (polyethylene polysulfide, 1/2 pint per 100 gallons spray), Triton B1956 (2 ounces per 100 gallons spray), and Dupont Sticker-Spreader (sodium sulfates of mixed long chain alcohol-fatty acid esters, 2 ounces per 100 gallons spray). The checks were sprayed with fungicide only. Zineb in water at the rate of 2 pounds per 100 gallons of finished spray was used as the fungicide on all treatments and the checks. The only difference between treatments was the spray additive used.

The variety planted was Ioana (known to be quite susceptible to Heminthosporium leaf blight.) It was grown on mature Everglades peat soil that had been cultivated several years. General fertilizer practices and spray applications of manganese and zinc were used to keep the plants in a good state of growth.

Twenty-five percent DDT emulsion in water was used at the rate of 1 quart per 100 gallons of finished spray material for budworm control. Four applications were made as blanket sprays when insect build-up demanded.

All treatments were applied with the Everglades Mule (a high clearance spray machine). A sufficient number of the Tee Jet nozzles to obtain good coverage were used and the sprays were put on at 300 pounds p.s.i. Eight weekly applications were made. Spray operations ceased when the tassels appeared.

Climatic conditions in the spring were very good for corn, but unfavorable for natural development of H. turcicum. One blanket application of spore suspension was made ten days before the tassels emerged. Late spring rains then favored the development of the disease and a uniform infection appeared. By the time the corn had matured the disease had made sufficient inroads to allow an intensity index to be taken.

Methods of evaluation used to determine the efficacy of the treatments were as follows: Intensity index as described by Ullstrup et al.[2]; total yield per block in pounds unhusked market-

Table 1. Summarization of the index data on spray additives trials in control of sweet corn leaf blight, 1951.

Treatment	1 (check)			P.E.P.S.			Triton B1956			duPont Spreader-Sticker		
Replicate	A	B	C[a]	A	B	C	A	B	C	A	B	C
1	3	90.0	10	3	87.5	10	3	87.0	9	3	90.5	10
2	3	85.0	10	3	87.5	9	3	83.0	9	3	81.0	8
3	2	81.5	9	3	86.0	8	3	86.0	9	2	91.0	7
4	3	85.0	8	3	91.5	10	2	87.0	9	2	82.0	10
Totals	11	341.5	37	12	352.5	37	11	343.0	36	10	344.5	35
Average	2.75	85.4	9.25	3.0	88.1	9.25	2.75	85.8	9.0	2.5	86.1	8.8

[a]A=Rating by method of Ullstrup et al.
B=Yield per block in pounds of unhusked marketable ears.
C=Fill index: 1 being no fill, 10 being complete fill.

[1]Stoner, Warren N. A preliminary report of results from some fungicide spray trials for control of Helminthosporium leaf blight of sweet corn. U.S. Dept. Agr. Plant Dis. Reptr. 34: 312-313. 1950
[2]Ullstrup et al. U.S. Dept. Agr. Plant Dis. Reptr. Supplement 193: 243. 1950

able ears; and filling of ears, rated on a basis of 1 for no fill to 10 for complete fill. The data of these indices are listed in Table 1.

These data indicate that under the conditions of this experiment, and light disease incidence, none of the spray additive materials used appreciably affected the control obtained. Since infection was late and only light to moderate, further investigations will be necessary to determine the influence of the materials under severe prolonged attacks of the disease.

The Plant Pathology Section would like to acknowledge with thanks the assistance of the B.F. Goodrich Chemical Company in the form of chemicals and a research grant for the conduct of this work. The Rohm and Haas Company and E.I. duPont de Nemours & Company, Inc., also supplied their respective materials.

EVERGLADES EXPERIMENT STATION, BELLE GLADE, FLORIDA

A PRELIMINARY REPORT ON THE TESTING OF SWEET CORN FOR RESISTANCE TO HELMINTHOSPORIUM TURCICUM PASS. AT THE EVERGLADES EXPERIMENT STATION IN 1950-51

Frank V. Stevenson, E. A. Wolf, and Thomas Bregger

The production of sweet corn in south Florida has grown rapidly in the past five years. Leaf blight caused principally by Helminthosporium turcicum Pass. has made increasingly serious attacks on the crop and appears to seriously threaten future corn production in southern Florida.

A breeding program aimed at the development of single crosses resistant to this disease was begun in 1950. A large number of inbred, hybrid, and open pollinated lines of corn collected from cooperators in the western hemisphere were grown at the Everglades Experiment Station during the spring of 1951 to determine their relative resistance to leaf blight as it occurs in this area. The disease was late in development, apparently because of unusually cool winter weather, but satisfactory readings were obtained from two plantings with good agreement existing between readings for the same line in both plantings in all except a few cases.

There is apparent resistance to leaf blight in sweet corn as was indicated by the response of 50 inbreds and more than 250 experimental and commercial hybrids and varieties included in this test. Fifty-two inbreds showed some resistance individually or in various hybrid combinations. Three of these inbreds were highly resistant. It is of interest to note that observations made this summer on plots in Indiana which were heavily infested with H. turcicum parallel the reaction obtained at the Everglades station.

Results of the above tests have been made available to cooperating agencies. Several workers have sent additional material for testing this fall and this has been planted. The writers would be interested in additional material from workers who would like to have some of their material tested for resistance to this disease under Florida conditions. The next planting will be made in January and results of this test will be available in May. Inbred lines remain the property of the originators with the stipulation that they may be used as a source of germ plasm in an effort to produce more highly adapted hybrids for this area. It is felt that the opportunity to test this year's production for susceptibility to Helminthosporium leaf blight is fair exchange for access to the breeding material supplied. Experimental hybrids or increase plantings on a small scale might also be made.

EVERGLADES EXPERIMENT STATION, BELLE GLADE, FLORIDA

STEMPHYLIUM LEAFSPOT AND STEM CANKER OF BIRDSFOOT TREFOIL

J. H. Graham

A disease causing a leafspot and stem canker of birdsfoot trefoil (Lotus corniculatus L.) was found in June 1950 in seven Northeastern States. At that time the disease was of minor importance except in one commercial field in New York. Here, young lesions were evident on stems and leaves of many plants. Young lesions on the leaves were round, reddish-brown, slightly sunken spots approximately 1-3 mm. in diameter. As they develop, the necrotic areas become slightly larger and darker and may be concentrically zonate; however, the leaves often drop before this stage. On the stems the copper-colored cankers varied in size from tiny dots to boat-shaped lesions 20 mm. long. The tissue surrounding the necrotic area usually had a water-soaked appearance.

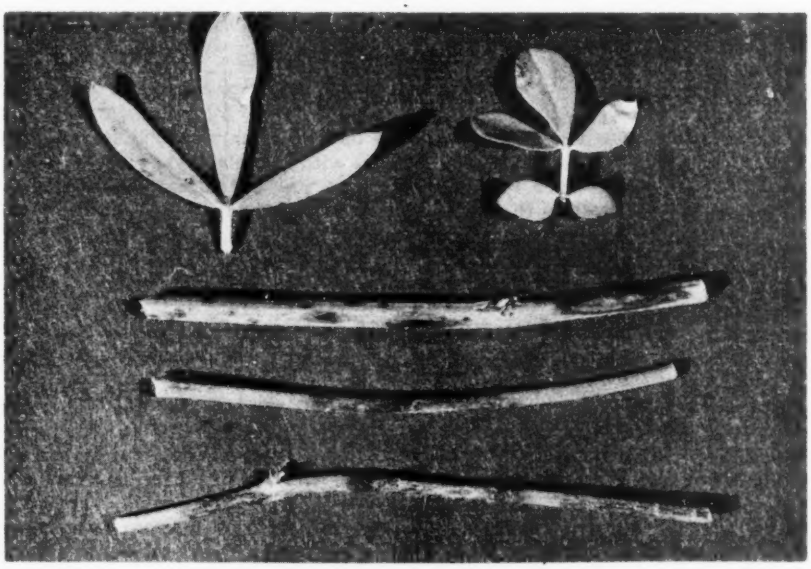

FIGURE 1. Leafspot and stem canker of birdsfoot trefoil, caused by Stemphylium sp.

An unknown species of Stemphylium was isolated repeatedly from the leaf and stem lesions. However, Rhizoctonia spp. and a species of Colletotrichum were recovered in some instances. In artificial inoculations in the greenhouse irregular-shaped, straw-colored stem lesions were produced by the Rhizoctonia culture while the Colletotrichum isolate was not pathogenic. The Stemphylium isolates produced stem and leaf lesions similar to those observed in the field. Infection was more severe than that found in nature. Many of the young seedlings were killed and the petioles of the older plants were infected, resulting in the loss of many of the leaves.

This species of Stemphylium is somewhat similar to S. sarcinaeforme, which causes zonate leafspot of red clover. The spore characteristics are alike but there are minor differences in mycelial growth. Also, immature fruit bodies are formed in some cultures of the trefoil isolates. In cross inoculation studies the isolates from birdsfoot trefoil failed to infect red clover and alfalfa and isolates from these plants did not attack trefoil. In these preliminary studies, Empire, European, and a narrow leaf variety were equally susceptible to the fungus.

U. S. REGIONAL PASTURE RESEARCH LABORATORY, STATE COLLEGE, PA.

SCLEROTINIA STEM ROT OF SOYBEANS

Donald W. Chamberlain

In late August of 1946 soybeans in two fields in Illinois were found to be infected with a white mycelial growth on the lower portion of the stem. Large black sclerotia were present, sometimes nearly concealed by the white mycelium. In September of the same year, specimens of diseased stems and pods were received from Alstead, New Hampshire. The withered, flattened seeds from these pods were covered with a white mycelium; black sclerotia of various shapes were found inside the pods, suggestive of the situation illustrated by Blodgett (1) for field beans in Idaho.

Platings made from mycelium within the pods, and from sclerotia from pods and stems, yielded Sclerotinia sclerotiorum (Lib.) DBy. in pure culture. This fungus has been reported as the cause of stem rot, a minor disease of soybeans in the major producing areas but occasionally destructive in a few fields. Weiss (3), in his Check List Revision, reported the disease for Maryland, Iowa, New York, and Virginia. Hildebrand (2) reported it from Ontario in 1946. It was found again in Illinois in 1950.

Pathogenicity Tests

A few experiments to test the pathogenicity of the organism were run in the greenhouse. A series of flats containing steamed soil were planted with Lincoln soybeans. One flat was inoculated by pouring inoculum (a water suspension of macerated mycelium and sclerotia) directly over the seed in the row before covering with soil; two identical flats were left uninoculated. All flats were maintained at greenhouse temperatures (65-70°F.). Each flat contained 75 seeds. All were watered equally as needed.

Emergence in the uninoculated flats was 97 percent; in the inoculated flat, only 26 percent. A watery soft rot of the hypocotyl and cotyledon was evident on the seedlings in the inoculated flat three days after emergence, with considerable white mycelial growth on the hypocotyl near the soil line. Only 10 percent of the plants survived 10 days after emergence. Sclerotinia was readily recovered from the diseased seedlings.

The uninoculated flats were inoculated after the seedlings had emerged by pouring a macerated mycelial suspension in water around the seedlings, by placing a sclerotium at the base of each seedling, and by placing a mycelial plug at the base of each seedling. An uninoculated flat served as a control. There was no evidence of infection in any of these flats six weeks after inoculation.

The experiment was repeated with unsterilized field soil. In this case there was no evidence of seedling damage and no appreciable difference in emergence over the uninoculated control.

In order to test the possible effect of temperature on disease development, pots of field soil were inoculated with Sclerotinia grown on cornmeal-sand medium and planted with 15 seeds per pot of the variety Lincoln. One pot, with an uninoculated control, was incubated at each of the following temperatures: 10°, 15°, 20°, and 25°C. No appreciable difference in emergence was noted between inoculated and control pots at 10° or 20°. At 25°, the inoculated pot showed 66 percent germination, while the control showed 100 percent; at 15°, emergence was 53 percent in the inoculated pot and 87 percent in the control.

The experiment was repeated twice with six inoculated pots and six controls at 15° and at 25°C. This time the mean emergence for inoculated pots was approximately the same as for controls. There was no evidence of seedling infection. The plants were allowed to grow for approximately two months, after which they were examined for evidence of the disease. Only two plants in the entire experiment were dead at the time of examination, both being on inoculated soil at 15°C. One of these showed sclerotia in the pith of the stem. Tissue transplants from inside the stems of both plants yielded Sclerotinia sclerotiorum. Since there were 90 plants in the inoculated group, this represents only slightly more than 2 percent infection.

An attempt to infect nearly mature plants was made by wounding the base of the stem below the soil line and applying plugs of mycelium and sclerotia from agar plates to the wound. No infection resulted.

Discussion

The aggressive attack of the fungus on seedlings in steamed soil appears to be another indication of what happens when the normal biological balance of the soil is disturbed. Unwarranted conclusions as to the virulence of a pathogen might easily be drawn as a result of such a routine

test for pathogenicity. Since there have been no records of seedling blight on soybeans caused by Sclerotinia sclerotiorum, and the tests herein described with unsterilized soil resulted in none, it seems unlikely that the fungus causes such troubles under field conditions.

Although the disease is considered a minor one on soybeans at present, it has caused considerable damage in localized areas on older plants. Hildebrand (2) reported almost complete destruction of three to four acres of soybeans in a 12-acre field in Ontario in September of 1946. Considerable damage occurred in one field in Illinois in 1950. The disease was not found in Illinois during the interim from 1946 to 1950. There appears to be no ready explanation as to why Sclerotinia stem rot, certainly one of the least prevalent of soybean diseases, can cause such severe but localized damage.

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DIVISION OF FORAGE CROPS AND DISEASES, BUREAU OF PLANT INDUSTRY, SOILS AND AGRICULTURAL ENGINEERING, AND ILLINOIS AGRICULTURAL EXPERIMENT STATION, URBANA, ILLINOIS.

A PRELIMINARY REPORT OF A NEW COMPOUND, TRANS 1, 4-DIBROMOBUTENE-2, FOR THE CONTROL OF DAMP-OFF[1]

George Swank, Jr.

The comparatively recent use of MC-2 (methyl bromide with 2 percent chloropicrin) and the recent development of OS-1199 (trans 1, 4-dibromobutene-2) have proven them thus far to be valuable materials for the control of damping-off organisms in celery seedbeds. The effectiveness of methyl bromide has been demonstrated by many workers. Disadvantages that confront the user of MC-2 are cost, necessity of an air-tight seal, and limited area which can be treated at one time. Trans 1, 4-dibromobutene-2 can be applied without such disadvantages. Tests by Kreutzer et al.[2] demonstrate the value of this material as a solid fungicidal and nematocidal soil fumigant in Fresno sandy loam soil.

It has been the practice of growers in central Florida to double or treble the amount of seedbed acreage that would be necessary to set celery fields. This practice is necessitated by failure to control damp-off. The added cost in labor, materials and seed is estimated to be 75 to 100 dollars for each additional bed sown. The data thus far obtained at the Central Florida Experiment Station indicate that OS-1199 is an economically good soil fungicidal fumigant that will control damp-off in celery seedbeds. This material was used as a solid on sandy soil.

Materials and Methods

A preliminary test was conducted during November and December of 1950 on a celery seedbed, using MC-2 and OS-1199. Results warranted further evaluation. A second test designed to include these and a number of other chemicals was conducted from January through April of 1951. Three replications of nine treatments, Table 1, were used. Methyl bromide with 2 percent chloropicrin was applied with the use of a "jiffy" applicator under an air-tight seal of sisal kraft paper. The cover was raised 5 inches off the seedbed with the use of a wooden prop to permit cir

Table 1. Treatment, rate of application of active ingredient, and disease rating obtained on sandy soil at the Central Florida Experiment Station when celery was used as a test crop.

Treatment[c]	Rate of Application of Active Ingredient	Disease Rating[b]
OS-1199	2 gr./sq.ft.	1.1
OS-1199	4 gr./sq. ft.	1.0
Flake para-formaldehyde	1 gr./sq. ft.	5.1
MC-2	1 lb./40 sq. ft.	1.7
275-D	4 gr./sq. ft.	4.3
SR-406[a] (10% active)	20-35 lbs./acre	5.6
Spergon[a] (12% active)	20-35 lbs./acre	3.9
Acetyl acetaldehyde	2 cc./linear ft.	4.5
Acetyl formaldehyde	2 cc./linear ft.	4.2
Check		4.7
L.S.D. 19-1		0.71

[a]SR-406 and Spergon dusts were applied after the plants were 1/2 to 1 inch in height. The rate of application was based on active and inert materials.

[b]The above disease rating was based on an arbitrary scale of 1 to 7, with 1 indicating little or no disease and 7 complete loss.

[c]The author wishes to thank the Shell Oil Company, Celanese Corporation of America, Dow Chemical Company, Mathieson Chemical Company, California Spray-Chemical Corporation, U. S. Rubber Company, and General Aniline and Film Corporation, for their courtesy in supplying the materials used in this test.

[1]Florida Agricultural Experiment Station Journal Series No. 16.

[2]Kreutzer, W. A., C. W. McBeth, Mason Turner, Glen Bergeson and Richard B. Whetstone. The fungicidal and nematocidal properties of dibromobutene. Science 113 (2945): 657-658. 1951.

culation of the gas. The MC-2 flowed into a metal trough as it was released from the container. The cover remained on the treated area for a period of 48 hours. The seed was sown four days later. OS-1199, 275 D, acetyl acetaldehyde and acetyl formaldehyde were mixed with fine vermiculite and spread over the surface of the soil. The materials were tilled in to a depth of 3 to 4 inches. Flake para-formaldehyde was used similarly but tilled in to a depth of 2 inches. SR-406 (10% active) and Spergon (12% active) dusts were applied after the plants were 1/2 to 1 inch in height. Six applications were made at three-day intervals. Fine vermiculite was used in all treatments at the rate of 2 quarts per 40 square feet. The materials were used on a raised seedbed 4 inches x 4 feet x 300 feet. The bed was covered with muslin cloth supported by "A" frames to reduce the intensity of sunlight falling on the germinating seed. The seed was sown on January 26, 1951, at the rate of 8 ounces per 1200 square feet. Water was circulated around the seedbed until the seed had germinated. The bed was then watered from overhead as often as required.

Results

Results obtained with the use of the various chemicals at strengths given in Table 1 indicate that trans 1, 4-dibromobutene-2 and methyl bromide were significantly better than the other treatments for the control of damping-off organisms. Considerable damp-off occurred in the check plots and in many of the other treated areas. Individual plants selected from the OS-1199, MC-2, and check plots illustrate the increased root growth of plants in the treated over the untreated areas (Fig. 1). The plant from the check plot is characteristic of many of the plants from the untreated beds in central Florida. The root tips die back, destroying the region of cell division, thus resulting in an overall stunted plant. Species of three genera of fungi - Rhizoctonia, Pythium, and Fusarium - have been isolated from diseased root tips. These species have been tested and their pathogenicity confirmed. A portion of a celery seedbed illustrating the effectiveness of MC-2 and OS-1199 is presented in Figure 2.

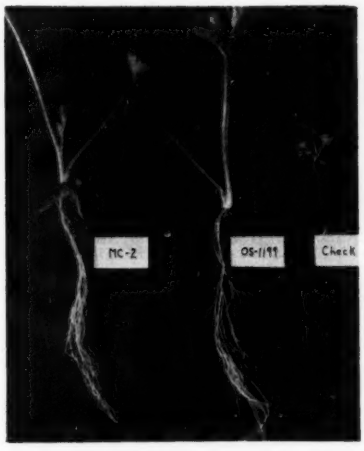

FIGURE 1. Celery seedlings from treated and untreated areas of the seedbed.

FIGURE 2. A portion of a celery seedbed showing results obtained with the use of various treatments. (A) 275-D, 4 grs. active ingredient per sq. ft.; (B) MC-2, 1 lb./40 sq.ft.; (C) acetyl acetaldehyde, 2 cc/linear ft.; (D) OS-1199, 4 grs. active ingredient per sq. ft.

No compound used in the tests was phytotoxic at the concentration given in Table 1.

According to the Shell Oil Company, the degree of mammalian toxicity of dibromobutene is not known. Data at present indicate that it possesses a high degree of toxicity. Care should be exercised in handling the material. The material is a lachrymator and therefore gives definite warning symptoms.

This report is preliminary and based on tests made from one season's data and limited to one area and soil type.

CENTRAL FLORIDA EXPERIMENT STATION, SANFORD, FLORIDA

WITCHES BROOM (ISHUKU-BYO) OF SWEET POTATOES IN THE RYUKYU ISLANDS (SECOND REPORT)

Eaton M. Summers

The discovery of a virus disease of sweet potatoes, apparently new to science, in the Ryukyu Islands was reported recently (PDR 35(6):266-267. June 15, 1951). At that time it was mentioned that a group of five scientists from Japan had been designated to make a more detailed survey and to report their findings and recommendations. A copy of their report has just been received.

The report of this survey party (two plant pathologists, two Entomologists and a plant (sweet potato) breeder) confirms all the fears expressed in the preliminary report mentioned above. They were appalled at the complete devastation of the sweet potato crop wherever the disease had struck. They have made sweeping recommendations to the United States Civil Administration of the Ryukyu Islands concerning detailed surveys to accurately delimit occurrence of the disease, quarantine measures to halt its spread, attempts to produce certified virus-free planting material, cultural practices that promise some relief and, lastly, a research program with all the ramifications indicated by the discovery of a serious new virus disease. No report of what action, if any, has been taken by the USCAR has been received.

The Japanese scientists are genuinely alarmed by the threat of this new virus disease to their own sweet potato industry which, incidentally, accounts for about 14 percent of Japan's indigenous food production. The Bureau of Agricultural Improvement, Ministry of Agriculture and Forestry, is demanding a substantial expenditure for the next fiscal year to finance sending three plant pathologists to the Ryukyus to study the disease and work out control measures. Quarantine inspections have been tightened at all ports, particularly in Kyushu (Southern Japan) where many small boats are wont to conduct their comings and goings somewhat surreptitiously. Every effort to exclude the disease will be made but, in the event it should be introduced, they hope to be prepared to cope with it.

This new virus disease of sweet potatoes has been named "Witches broom" because of the most notable symptom, excessive proliferation of small leaves, by the Japanese scientists. I consider the name acceptable and descriptive.

During their survey of the Ryukyu Islands this party encountered a mosaic disease of sweet potatoes occasionally in Motobu and Kamimotobu areas in the northern part of Okinawa Island. They suggest that it is probably the same as the one described by Doolittle and Harter from the United States.

Since the confirmation of our original findings by this group of Japanese scientists it seems opportune to reiterate our earlier warnings of the importance of some official recognition or investigation of this new virus disease of sweet potatoes by duly constituted authority of the United States Department of Agriculture.

My personal experience with this disease leads me to compare it, in complete devastation of the crop, with such diseases as watermelon wilt and yellow dwarf of onions before control measures for them were worked out.

UNITED FRUIT SUGAR COMPANY, PRESTON (ORIENTE), CUBA.

CHLOROTIC PHYLLODY OF STRAWBERRY

A. G. Plakidas

A disease of very striking appearance, and apparently new and undescribed, was first observed on strawberries in Louisiana in the spring of 1949. The disease appeared again in the spring of 1950, but it was less prevalent than in the previous season. Although difinitely of minor economic importance because the number of affected plants was very small, the disease was so striking in its symptomatology that it deserves description and recording in order to bring it to the attention of other investigators.

The most prominent symptoms were chlorosis of the foliage and phyllody of the flowers. The color of the leaves (general chlorosis without any definite pattern) varied from pale-green in some plants to brilliant yellow in others, so brilliant that the affected plants could be seen in a field from a distance. The phyllody, also, showed considerable variation. In some flowers, the petals and all the carpels were transformed into miniature leaves, with spindly petioles about 1/4 to 1 inch long, forming a loose rosette (Fig. 1); in others the petals became green in color but retained their normal shape, and the carpels enlarged to form stipitate, puffed, bladder-like structures; in still others, a few of the carpels in the center of the receptacle remained normal in shape and size, but the outer ones, as well as the petals, were phylloid.

FIGURE 1. Strawberry flowers showing varying degrees of phyllody.

In the advanced stage of the disease, the leaves are much reduced in size, with short petioles, and the whole plant assumes a stunted, bright yellow, rosetted appearance. The disease is self-eliminating because all the affected plants die with the advent of warm weather, usually about the middle of May.

In its symptomatology, the disease is suggestive of aster yellows, or possibly of some of the diseases caused by the big-bud group of viruses. The strawberry is considered as non-susceptible to the aster yellows virus. Kunkel[1] in two separate trials failed to transmit aster yellows virus from diseased asters to strawberries by means of leafhoppers (variety of strawberry used not stated), and Demaree (letter to the author) was unsuccessful in attempting to transmit the aster yellows virus to the Marshall variety of strawberry by means of dodder grafts. It is possible, however, that some strawberry varieties are susceptible. It may not be without significance that the disease was found on two of the new varieties, Klonmore and Marion Bell, but not on the old variety, the Klondike.

There was no correlation between the disease and any particular set of soil or cultural conditions. The disease was found scattered in many fields in four different parishes (East Baton Rouge, Livingston, Tangipahoa, and Ascension). Affected plants were found next to normal plants. The root system of affected plants appeared as extensive and as normal as that of healthy plants.

An attempt was made to transmit the disease by runner-grafting, but it was unsuccessful because most of the plants died and the surviving ones made weak growth unsuitable for grafting. On March 25, 1949, twelve diseased plants were dug up in the field with a ball of soil so as not to disturb their roots and transplanted to large (12-inch) pots. It was hoped that these plants would produce runners to be used for grafting onto runners of healthy plants. However, 11 of the 12 plants had died by the end of May. The one surviving plant was removed into a lath house. It survived the summer and produced six spindly runner plants. These were led to root in soil in six-inch pots, and two of the largest were grafted onto runners from healthy plants. The grafts failed to take.

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[1] Kunkel, L. O. Studies on aster yellows in some new host plants. Contrib. Boyce Thompson Inst. 3: 85-123. 1931.

All the potted plants were removed outdoors in October and were kept under observation until the end of March of 1950. The chlorotic condition of the foliage disappeared during the summer and fall, but beginning about the middle of January, four of the surviving plants (the original and three of its runners) began to show both chlorosis of the leaves and phyllody of the flowers, and both symptoms became very pronounced during February and March. The other three runner plants did not show any disease symptoms. If this is a virus disease, it would appear that some of the runners are able to outgrow the virus.

LOUISIANA AGRICULTURAL EXPERIMENT STATION, BATON ROUGE, LOUISIANA

A MICROSTROMA ON PEACH

William W. Diehl

During the month of August 1951 specimens of peach foliage with conspicuous necrotic lesions (Fig. 1) bearing fructifications of a fungus apparently not previously recorded as on peach were found at the South Carolina Sandhill Experiment Station near Columbia, South Carolina, and submitted for examination at the instance of Professor G. M. Armstrong of Clemson College. The fungus was evident as minute, grayish-tan pustules chiefly at the center of the older necrotic areas on the lower leaf surfaces. It was readily referable to the form-genus Microstroma, but a rather extensive search for records of any species of Microstroma or related fungi on peach in the United States or abroad was unavailing.

There is, however, one species, M. tonellianum Ferraris, reported as on plum in northern Italy, that has certain features suggesting relationship if not identity. It was described by Ferraris (4) in 1914 as fruiting on the underside of plum leaves where characterized by necrotic spots. The type specimen was found by A. Tonelli in the vicinity of Valsalice, Torino, Italy, and at the time no consideration was given to its pathogenicity except that the fungus fruited on the leaf-spots. A few years later, however, it received some attention as the pathogen causing injury to both foliage and fruit of plum:

Ciferri (3) in 1922 discussed this then recognized fungus as the cause of a relatively new and rare disease of plum foliage which had lately been found in Italy on a variety of plum obtained from Luther Burbank in America. Bergamaschi (1, 2) in 1931 some years later reported the same fungus as the cause of a diseased condition of fruits of the plum (Prunus domestica L.) in Northern Italy and at the same time it was included by Pollacci (5) in a list of plant pathogens studied at his institution.

As described Microstroma tonellianum is very similar to the fungus on peach from South Carolina, differing slightly in the dimensions of conidia, a technical difference that can only be evaluated by means of a critical comparison of specimens and cultures together with inoculation trials. Until adequate studies will have been made, however, it is convenient to regard the peach fungus as distinct.

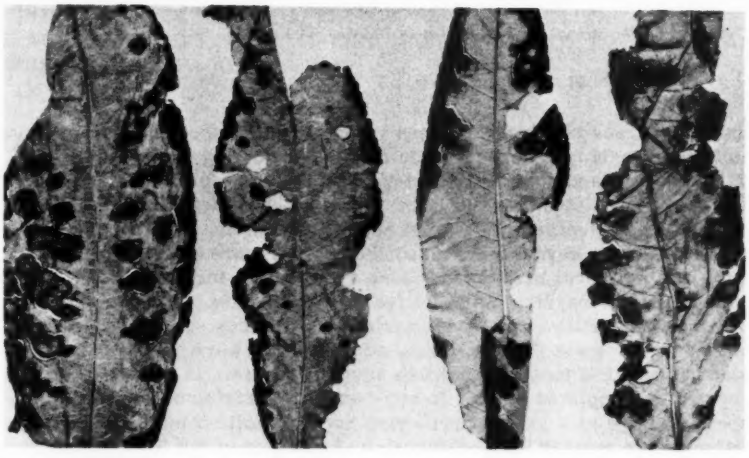

FIGURE 1. Peach leaves with necrotic areas bearing Microstroma sp. X 3/4 Photograph by R. L. Taylor.

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DIVISION OF MYCOLOGY AND DISEASE SURVEY

AN APPARENT VIRUS DISEASE OF CASUARINA IN THE AMERICAN TROPICS[1]

Frederick L. Wellman and Theodore J. Grant[2]

The so-called Casuarina pine, Pino de Australia, or Beefwood tree (Casuarina equisetifolia L.) is an introduction from the Orient that has been used a long time in tropical and subtropical America. It grows rapidly, resembles a pine in its habits, and is of considerable economic and ornamental value. It produces tanning and dye bark; has been used, experimentally, for pulpwood in paper making; is a source of firewood; and is burned also as charcoal. It is planted for soil conservation and reforestation in some areas; and it is sometimes grown for shading coffee trees. Ordinarily, it is fairly free from foliage troubles and grows well under a wide variety of warm-country conditions.

Conspicuous brooming symptoms were first seen on this tree in Costa Rica in 1947. These were observed in several locations in the environs of San José, and southwest in the mountainous region of San Ignacio. Diseased trees were observed also in other parts of the country, farthest west from San José and farthest east in Paraiso. The trouble was found also in Mexico and in the Panama Canal Zone.

From the many diseased Casuarina trees seen in these locations, six were selected for close observation. Dried specimens were made of the diseased foliage and deposited in the United States Mycological Herbarium at the Plant Industry Station, Beltsville, Maryland. These are all listed under Wellman collection numbers as follows:

1756 Vuelto de Jorcas (San Ignacio), C. R., Sept. 23, 1947

2094, 2140 Palmares, C. R., Apr. 24 and Mar. 17, 1950.

2132 Leon, Mexico, Oct. 5, 1950.

2174 Summit (Panama), Canal Zone, May, 1951.

2183 Paraiseo, C. R., June 9, 1951.

All these collections came from trees that had the gross virus symptom spoken of as brooming. This symptom consists of multiple branching, characteristic of virus brooming on trees. Some affected trees had a dead central leader, and some had dead side branches. Completely dead trees were also found; some of these were still standing, but others had been felled. On closer scrutiny, some gave evidence of recent infection and of what appeared to be the starting of disease symptoms. On living trees that were severely diseased the brooms were distributed in a more or less disorderly fashion on the lateral branches. Close examination through a hand lens showed that many of the succulent and photosynthetically active modified stems, which serve as leaves, were irregularly mottled with a pattern plainly characteristic of virus causation.

Scattered over the surface of these "leaves" were delimited areas that were yellow to yellow-green, making dark green islands typical of mosaic markings in other plants. In some trees, the mottling had the appearance of partly completed rings. In none was any striping observed, but in some trees the symptoms appeared more as a general yellowing and a definite thinning of the foliage. The diseased green portions were notable for considerable shortening of the internodes. There was some necrotic marking of the foliage, and killing of tip buds.

The result was a marked stunting of foliage when compared with leaves on obviously symptom-free trees. Viewed from a distance, many of the badly diseased trees, if not dead or dying, had

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[1]This contribution was made possible through the cooperation of the Ministry of Agriculture of Costa Rica, the Office of Foreign Agricultural Relations of the U. S. Department of Agriculture, and the Inter-American Institute of Agricultural Sciences at Turrialba, Costa Rica. United States participation in this work was carried out as a part of the Point IV program, administered by the Technical Cooperation Administration, U. S. Department of State.

[2]Dr. Wellman, consultant in plant pathology, and agriculturist, Office of Foreign Agricultural Relations, U. S. Department of Agriculture; Dr. Grant, while making these studies, agricultural attaché, U. S. Embassy, San José, Costa Rica.

an unbalanced and awkward appearance owing to loss of apical dominance and development of a shortened and bunchy growth of side branches.

In addition to the study of symptoms, some attention was also given to the severity of effects of this disease. In San Ignacio, Costa Rica, when the disease was first found, in 1947, there were 40 badly diseased trees scattered in one planting of 98 on a hillside. Several hundred other Casuarina trees were seen in this region, and it was estimated on the first visit that between 10 and 15 percent of them were obviously diseased. In 1951, three and a half years later, these plantings were revisited. At this time about twice as many diseased, dying, and dead trees were seen as had been found there before.

Another count was made in Costa Rica of the diseased trees in a planting in the central plaza of the city of Palmares. When a count had been made of trees still standing, of stump remains, and of spaces from which trees apparently had been removed, it was seen that about 66 trees had at one time been established in the plaza. At the time of observation, 44 were still standing and 22 of these were very weak and showed severe signs of the trouble. Others had milder symptoms, but no counts of these were made as they had been trimmed high and their foliage could not be obtained for closer examination.

In the Panama Canal Zone, several diseased trees in the Arboretum of the Summit Gardens were also much weakened from disease, and some evidently were on the point of dying. Certain of the diseased trees in Mexico also appeared to be in a much weakened condition.

A review of available literature has disclosed no previous report of virus disease symptoms of Casuarina. Press of other duties has not afforded time to secure proof of the virus nature of the disease just described, or evidence of how it is spread. However, symptoms are un-mistakably those characteristically caused by virus infection. Wherever progress of disease has been watched, it has appeared to increase in severity. It should be studied further. There seems little doubt that it will be found important in the future if its host is to be grown in the Americas. It may be found in many other tropical or sub-tropical places than those reported, and might become a serious limiting factor in growing Casuarina.

COOPERATIVE BETWEEN THE MINISTRY OF AGRICULTURE OF COSTA RICA; THE OFFICE OF FOREIGN AGRICULTURAL RELATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE; AND THE INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES AT TURRIALBA, COSTA RICA.

COFFEE TRUNK AND STEM CANKER IN GUATEMALA[1]

Michael Szkolnik [2]

Pontis (3) reported a widespread occurrence of a canker disease of coffee trees in Colombia and also reported that the disease was observed in Venezuela. According to Pontis, gradual yellowing of foliage is practically the only initial external indication of a diseased tree. The bark exterior appears to be normal but scraping away the bark surface reveals the infection as a brown to black irregularly shaped canker. The black coloration, or staining, was reported to penetrate the wood for depths up to about two centimeters. The disease progresses slowly and eventually girdles the trunk or stem and causes gradual decline of distal parts.

Aware of earlier disagreement over the etiology of coffee diseases with similar symptomatology reported by other authors (2, 5), Pontis made further studies of the causal pathogen. Through isolation, inoculation, and morphological and histological studies, he proved the causal fungus to be a Ceratostomella, whose cultural and morphological characteristics closely resemble those of C. fimbriata (Ell. & Halst.) Elliott [= Endoconidiophora Although he failed to infect coffee trees with C. fimbriata isolated from sweet potatoes infected with black rot, he believes the coffee isolate is another strain of the same fungus species and proposes that the isolates from coffee be assigned to the species C. fimbriata.

In the fall of 1949, the writer observed the same or a very similar coffee disease in Guatemala, in a coffee plantation located at an altitude of approximately 2500-3000 feet on the southwestern slope of Volcano Santa Clara. The particular planting in which the diseased trees were found was estimated to be 15 to 20 years old. The greatest concentration of infected trees was observed in the depressions of broken volcanic terrain where water was apt to drain during rains. The diseased trees were usually found in rather densely shaded areas. Dense shade and other conditions favoring prolonged maintenance of a wet, humid environment may account for the greater concentration of the canker disease in the described location.

The symptoms observed on diseased coffee trees in Guatemala were very similar to those described by Pontis (3). The foliage, either on certain branches or throughout the infected plant, was in an obvious state of decline. Leaf coloration changed from normal dark green to pale green and yellow and eventually wilted. This suggested a root disease or a trunk or stem canker. The latter suspicion was proved correct only through close examination because, in most cases, the external bark over the cankers is almost indistinguishable in color and texture from healthy bark. Many of the infections examined appeared to have initiated on the trunk near the soil level. It is possible that a large number of these infections occurred through bark wounds made by natives with machetes and other implements during weeding operations. The coffee cankers are not limited to the basal portion of the trunk. Individual canker infections were observed on several occasions to occur 4 or 5 feet high on main trunks or branches.

Although the apparently normal external appearance of the bark obscures the diseased bark and wood beneath, many advanced cankers may be detected by noting the slight depression of the bark in the cankered area. This depression results following death of bark tissue; the slight reduction in bark thickness is due to partial desiccation of killed bark. Cankers on roots of freshly uprooted trees are usually more conspicuous externally than those above ground because there is a sharper contrast between the cream color of healthy bark and the dark color of the cankered area. The normal bark color above ground is gray-green.

The most severe case of the disease examined was a canker at the base of a coffee trunk nearly 5 inches in diameter which was girdled by the canker. Vertical extent of this girdling canker was measured at 45 cm.; 15 cm. of this vertical advance extended below the soil level. Coffee cankers were noted to spread slightly more rapidly vertically than laterally. The vertical advance often progresses as a broad spiral which tends to follow the natural twist of the trunk.

Paring away the bark surface over the canker reveals a deep brown to black coloration of the tissue beneath. The coloration (or staining) usually forms a discrete edge between the cankered tissue and apparently healthy bark and wood. In young canker infections the staining was found to be rather shallow, but in advanced infections the staining was noted to penetrate the bark and extend into the wood. The greatest depth of staining into the wood was measured at slightly more than 1 cm.

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[1] Pathological work on coffee was conducted while the author was controlling cinchona diseases for Experimental Plantations, Inc., Guatemala and Costa Rica, Central America, a subsidiary of Merck and Company, Inc., Rahway, New Jersey.

[2] Writer's present address: New York Agricultural Experiment Station, Geneva, New York.

Tissue plantings of diseased bark and wood on potato-dextrose agar yielded a slow-growing Ceratostomella with cultural and morphological characteristics closely resembling those described by Pontis (3). To determine the pathogenicity of the isolates, the fungus was inoculated into coffee trunks by a technique consisting of (a) removing a plug of trunk bark with a cork borer, (b) inserting an approximately 4 mm. square of the fungus inoculum grown on potato-dextrose agar, and (c) sealing the inoculum and hole over with white vaseline. The coffee canker isolate was inoculated into two species of coffee, namely, Coffea arabica and C. bourbon. Both species became infected and reisolation yielded the same fungus as was inoculated. The canker infections showed the same black staining and other characteristics observed in natural infections. The infections advanced very slowly. The maximum advance of infection measured 34 days after inoculation was 2.5 cm. from the site of inoculation.

During inoculation studies, the Ceratostomella isolate[3] from coffee cankers was inoculated into Cinchona ledgeriana, C. succirubra, and cinchona hybrid clone ZM to determine whether the pathogen from coffee cankers infects cinchona. None of the Cinchona species inoculated became infected by the coffee pathogen. Inoculation studies also were carried out to determine whether two cinchona pathogens, namely, Phytophthora parasitica, which causes girdle canker (1, 4), and P. cinnamomi, which causes stripe canker (1), are pathogenic to coffee trees by inoculating these Phytophthoras into trunks of Coffea arabica and C. bourbon. Both Phytophthoras failed to infect these coffee species.

Suggested Control Measures

Considering the areas in which the canker disease of coffee is more likely to prevail, it appears that modification of certain cultural practices in these areas would help reduce tree losses. These modifications should include (a) reduction of shade in critical areas, (b) construction of diverting drainage ditches to prevent general waterwashing over drainage areas, and (c) keeping the critical areas relatively free of tall weeds and brush which helps maintain wet, humid conditions. Care undertaken during plantation weeding should account for reduction in mechanical wounds of coffee trunks, thus providing fewer portals of entry for the pathogen.

Severely diseased plants should be uprooted and burned. Trees with isolated cankers on random main branches can be saved by pruning the branches at least several inches below the maximum advance of the canker and destroying the pruned branches.

Summary

A trunk and stem canker disease of coffee trees was observed in Guatemala. This disease evidently is the same as that reported by Pontis (3) to occur in Colombia and Venezuela and caused by Ceratostomella fimbriata (Ell. & Halst.) Elliott.

The disease in Guatemala was found to occur more commonly in areas in which wet and humid conditions prevail. Trunk wounds are believed to play a significant part in favoring natural infections.

Predisposing the critical areas to better aeration and drying and reduction of mechanical wounds during weeding operations are believed to be measures which should account for appreciable reduction in losses of coffee trees. Pruning can be employed to advantage to prevent spread of isolated infections to other parts of the tree.

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EXPERIMENTAL PLANTATIONS, INC., GUATEMALA AND COSTA RICA, CENTRAL AMERICA

[3]Isolate NL333 sent to Division of Mycology, U.S. Department of Agriculture

WINTER OF 1950-51 DAMAGING TO SOUTHEASTERN WOODY VEGETATION

G. H. Hepting, J. H. Miller, and W. A. Campbell

Temperature extremes during the winter of 1950-51 were very damaging to plants over wide areas in the Southeast. The extent of this damage, the species affected, and the climatic conditions responsible are herein reported for western North Carolina and for Georgia, chiefly in the Athens area.

The fall of 1950 was unusually warm at Asheville, North Carolina, up to the last week in November. At 7:30 a.m. on November 24, the temperature was 47°F. Twenty-three hours later it had dropped to 1°F., the lowest November temperature ever recorded for Asheville. On November 25, the maximum temperature was 8°F., the lowest maximum for any day of the year ever recorded by the United States Weather Bureau in that city. The temperature during this November storm was at or below freezing from noon, November 24, until noon November 29. The weather was unusually cold during the rest of the winter, with lows at Asheville of 1°F. in November, 10°F. in December, 15°F. in January, and 4°F. in February.

As a result of the warm fall, plants were not hardened sufficiently to withstand the 46-degree drop in less than 24 hours on November 24-25, and the several days of subsequent sub-freezing temperatures.

Some of the effects of the 1950-51 temperature extremes were browning of the foliage of arborvitae (Thuja spp.), killing boxwood (Buxus spp.) in localized areas, the development of abundant frost cracks in the bark and wood of trees, particularly oaks (Quercus spp.) and Asiatic chestnuts (Castanea spp.), some killing of biennials such as snapdragons, and the severe killing of English ivy (Hedera helix). In the memory of local inhabitants this is the first time that English ivy on many walls and houses was killed to the ground at Asheville. Privet (Ligustrum amurense) was defoliated and magnolia (Magnolia grandiflora) foliage turned brown.

Starting in the spring of 1951, dozens of cases of slime flux were reported in white oak at the base of the trunks and on exposed large roots. This fluxing apparently developed following yeast infection through bark cracks formed as a result of the sudden cold. In the experience of foresters and pathologists, the widespread development of so much slime flux was unprecedented.

At Athens, Georgia, the temperature pattern followed closely that of Asheville, 140 miles north. The first three weeks in November, however, were about average so far as temperature extremes were concerned. On November 25, the temperature dropped to 8°F. and rose no higher than 19°F. during the day. On November 26, the minimum was 14°F. and the maximum 45°F. Following these two days with exceptionally low minimum temperatures the weather rapidly reverted to a normal pattern. The longest period of severe cold occurred early in February when temperatures dropped to 11°F., with continuing minimums of 12°F., 18°F., 22°F., and 23°F., for approximately one week.

The Athens weather pattern prevailed over most of the State. Lows of 11°F. were recorded on November 25 at Tifton and Glennville in extreme south Georgia.

Most of the damage to vegetation is believed to have occurred during the November freeze since many plants had not hardened sufficiently to withstand severe cold. Strong winds that accompanied the freeze contributed to the damage by cracking and splitting the frozen tissues.

Most of the severely affected perennials were introduced ornamentals or cultivated fruit trees. Native trees and shrubs were not noticeably injured. In some cases, cold symptoms were exhibited immediately, and in others the effects were evident the following spring or summer.

Boxwood showed blanching of upper leaves just after the freeze, and during the summer of 1951, most plants recovered almost completely. Camellias (Camellia japonica) were so severely injured that there were no blooms this past winter even in south Georgia. Fairly young Cedrus deodara trees, not over 20 years of age, died down from the terminal bud at least 5 to 10 feet. This type of dieback has been evident for many years, but this is the first time it can be seen in almost every young tree. Also, this is the first time within 50 years that crape myrtle (Lagerstroemia indica) has been seriously killed back. Many large trees have died this summer.

The china-berry (Melia azedarach) was the only tree in the woods visibly affected to the extent of dieback of large limbs. The oaks, especially the white oak, exhibited the same cracking at the base and on exposed roots as in North Carolina. During early summer, the plant pathology department was literally besieged with inquiries about this slime flux on white oaks.

The Himalayan white pine (Pinus griffithii), the cypresses (Cupressus spp.), the ornamental junipers, chiefly Juniperus communis and varieties, the monkey puzzle (Araucaria araucana), and incense-cedar (Libocedrus decurrens), were the conifers severely injured. The Himalayan white pine was especially affected. One tree 75 years old, in an Athens yard, was killed. Arbor-vitae

(Thuja orientalis) and native junipers (Juniperus virginiana) were not injured.

The dieback of the privet hedges and particularly the large-leafed species (Ligustrum ovalifolium and L. japonicum) was most noticeable from Athens all of the way to the Florida line. Also, English ivy on brick walls and on trees soon turned brown all of the way to the ground. Since then it has sprouted somewhat from the base. Firethorn (Pyracantha coccinea), and Photinia spp. showed varying degrees of dieback, which has continued in many cases during the summer. The chaste-tree (Vitex agnus-castus), even trees 10 to 15 feet high, died back almost to the ground. The weeping willow (Salix babylonica) developed many dead limbs during the early summer. The camphor tree (Cinnamomum camphora), which has been planted extensively in areas below the fall line, was severely affected and some large plants died during the summer.

The only fruit tree widely injured by this freeze was the apple. Many trees in home orchards in the Piedmont, especially between Athens and Atlanta, bloomed and put out leaves and then died during the hot dry weather in May. At Jasper, Georgia, peach trees were also killed, and bamboo died to the ground line. At Tifton, many of the plants already listed were injured, and also azaleas, camellias, pittosporum, and oleander. Many fig trees were killed in Georgia.

DIVISION OF FOREST PATHOLOGY, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, U.S. DEPARTMENT OF AGRICULTURE, ASHEVILLE, N.C., AND ATHENS, GA., AND DEPARTMENT OF PLANT PATHOLOGY, UNIVERSITY OF GEORGIA, ATHENS, GA.

WINTER INJURY TO ASIATIC CHESTNUT TREES IN THE SOUTH DURING NOVEMBER 1950

Frederick H. Berry

Asiatic chestnut trees, in a number of plantings throughout the southern United States, were injured by the cold wave that swept across this section during November 1950. Similiar injury to these tree species occurred in November 1940, and was reported by Crandall.[1]

United States Weather Bureau records for this section show that during the first part of November 1950 temperatures were relatively high, with all-time high temperature records being broken at weather stations in Georgia, Maryland, North Carolina, and Virginia. On November 1 temperatures of 94°F. and 88°F. were recorded at stations in Georgia and Maryland respectively, and the following day a high of 90°F. was recorded at stations in North Carolina and Virginia. This unusually warm weather was followed during the last week of the month by the most severe November cold weather on record in the Southeast. In Mississippi, Alabama, Georgia, and South Carolina previous November low temperature records were lowered at practically all stations. In Mississippi lowest temperatures ranged from 4°F. in the north to 23°F. on the coast, and in Alabama from -2°F. in the north to about 20°F. on the coast. The low temperature for Georgia was 0°F. recorded at both Jasper and the Blairsville Experiment Station. In South Carolina the lowest temperatures ranged from slightly below zero in the mountains to about 17°F. on the coast. Temperatures reached their lowest levels in most areas on the morning of the 25th, and continued much below normal until the end of the month.

The warm weather of October and the first part of November prolonged the growing season for chestnut trees as it did for other tree and shrub species. The result was that the trees were not yet dormant and were unable to endure the sudden and severe drop in temperature, which in many localities was the first frost of the season.

During July 1951, the writer examined a number of Asiatic chestnut plantings in the Southeast, and, among other things, observed considerable winter injury to a large number of trees. These observations have been supplemented with reports sent in by cooperators having chestnut plantings.

From all available reports it appears that injury to Asiatic chestnut trees was most severe in the southwestern part of North Carolina and northern part of Georgia, although injury was recorded in plantings in Kentucky, Virginia, Tennessee, Mississippi, and Alabama. (See Figure 1.)

There was no opportunity to take detailed records, but general observations revealed that both the Chinese chestnut (Castanea mollissima), and the Japanese chestnut (C. crenata) were susceptible to winter injury. One-year-old grafts of the Nanking, Meiling, Kuling, and Abundance varieties of the Chinese chestnut, growing at Fort Valley, Georgia, suffered no injury, although the temperature dropped to 9°F. on November 25 and continued below freezing for the rest of the month. The Hobson variety of the Chinese chestnut was reported as winter hardy at Jasper, Georgia, where the temperature dropped to 0°F. At this same locality the Seguin chestnut (C. seguinii), which normally has twigs killed back nearly every winter, escaped with little or no injury.

At the U.S. Department of Agriculture Plant Introduction Garden near Savannah, Georgia, Chinese chestnut trees survived the freeze with very little injury, but Castanopsis delavayi trees, approximately 30 feet in height, were killed to the ground when the temperature dropped from a high of 66°F. on the 24th to a low of 14°F. on the morning of the 25th. C. delavayi had previously survived a minimum of 14°F. with only minor injury, so it appears that the damage was due to the sudden drop in temperature after a period of mild weather rather than to the low temperature to which the trees were subjected. The roots of these trees were evidently not injured since all of them had sprouted from the base of the original trees.

Various cultural treatments given the trees during the previous summer and fall, which delayed dormancy, appear to have had a direct bearing on the severity of damage. Trees that were cultivated late, fall pruned, mulched, or released from competing growth were usually damaged the most. Air drainage at the planting was another factor in the severity of damage. Where air drainage was good, trees usually came through with very little injury.

Frost cracks, along the trunk and larger branches, were found on many of the trees examined. The cracks, from a few inches to over 7 feet in length, split the bark and some extended deeply in-

[1] Crandall, Bowen S. Freezing injury to Asiatic chestnut trees in the South in November 1940. Plant Dis. Reptr. 27: 392-394. 1943.

FIGURE 1. Locations of Asiatic chestnut plantings, showing no, slight, or severe freezing injury. Slight injury indicates up to 25 percent of the trees injured, but 1 percent or less of the trees killed; severe injury indicates that 30 percent or more of the trees were killed.

to the wood. These cracks provided ideal entrances for the chestnut blight fungus (Endothia parasitica). Many of the frost-injured trees were covered with pycnial spore horns this summer, indicating that severe injury from the blight has already occurred where trees were subjected to multiple frost cracking.

Trees of all sizes and age classes were injured. The more vigorous trees suffered the most injury, indicating that those in a less vigorous condition were further into dormancy at the time of the freeze.

DIVISION OF FOREST PATHOLOGY, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

SHORT FLOWER SPIKES ON GLADIOLI DUE TO DEFECTIVE ROOT SYSTEMS

J. G. Bald

During the autumn and early winter of 1950 a gladiolus grower in San Diego County, southern California, complained of the presence of many unsaleable flowers in his crop. The spikes were short, sometimes barely taller than the leaves, and often the flowers failed to open properly. The shoots were normal in appearance but sometimes slightly stunted. When such plants were dug, very few roots were found emerging from the parent corms, and none from the developing new corms above. The parent corms of plants with flower spikes of normal length and vigor had much better root systems, but again there were few or no roots on the new corms. Further observation suggested that under conditions of late fall and early winter in southern California roots are seldom produced on the young corms, and the gladiolus plants must complete their development with the root systems of the parent corms. When these root systems are defective, the plants may grow normally up to a certain stage, but later growth (in this case extension of the flower spike) may be drastically curtailed.

Normal plants, plants with short spikes, and corms of the planting stock still in cool storage were examined. On the bases of both the planted and unplanted corms was evidence that roots had emerged at some earlier period, grown up to 1 cm. long, and been killed back. The killing penetrated to the origins of these roots, sometimes deep in the corms, and no new roots or only a few feeble roots had emerged on planted corms from affected sectors around the basal plate.

Isolation of organisms from around the necrotic root bases gave no recognized pathogens, but mainly Penicillium spp. One type of Penicillium was culturally indistinguishable from a Penicillium used in inoculation tests on gladioli, which grew on injured corm tissue at 40°F. and produced definite but very restricted lesions.

In spite of the failure of the damaged corms to put out the usual number of roots when planted in the field, they could still form adequate root systems if stimulated by a rooting hormone. In a small experiment, Hormodin 1 and Hormodin 2 were applied to the bases of the corms, and the corms were then planted. The hormone treatments increased the number of roots produced by about 40 percent over the checks, induced formation of new roots where the first ones had been killed, and greatly increased the average diameter and vigor of the roots. This proved that destruction of the tissues failed to extend much beyond the dead root bases. The presence of a Penicillium barely capable of pathogenic action fully explained the extent of damage observed.

The original corms had been dug during the previous winter, and remained stacked in trays either in the field or an open shed until they were cleaned. By that time or soon afterwards roots and small shoots had emerged. Corms dug in such cool weather have no true dormancy. Cleaning and subsequent handling injured the tips of the emerging and growing roots, and in this condition the corms were placed in cool storage. The roots died back to their origins, their destruction being encouraged by Penicilliums that colonized the dead and wounded tips and grew slowly at storage temperatures. When taken out for planting at the end of summer, many of the corms were incapable of forming adequate root systems, and short spikes were the final result. Similar destruction of roots has occurred under experimental conditions. Other examples of gladioli with short flower spikes, appearing during early winter, had a similar history.

This condition may be prevented by proper curing of corms dug in the colder periods of the year. A temperature of 95°F. and humidity around 80 percent is suggested. Temperatures at and above this level delay sprouting and the emergence of roots on gladiolus corms. The curing should be begun immediately after digging, continued six or seven days until the corms are ready for cleaning, and up to a week after cleaning. The corms may then be placed in cool storage in a relatively dormant condition. This treatment is suggested also for reducing the carryover of fungus pathogens and of subsequent storage rots. It should be combined with fungicidal treatment of the corms. A possible method of countering poor root development on corms already injured is indicated by the root hormone trial. However, no details for this kind of treatment have been worked out.

DIVISION OF PLANT PATHOLOGY, UNIVERSITY OF CALIFORNIA, LOS ANGELES

THE EELGRASS SITUATION AT CAPE ANN, MASSACHUSETTS, IN THE SUMMER OF 1951

Ralph W. Dexter

Since the disappearance of eelgrass (Zostera marina L.) from the eastern coast of North America in 1931-32, periodic reports have been issued on the status of this marine plant at Cape Ann, Massachusetts. The last of these reports was published in Ecology (31 (2): 286-288. 1950). In July of 1951 the writer had another opportunity to resurvey the existing growth of eelgrass at Cape Ann and to determine in a general way its progress toward reestablishment.

Goose Cove still had a solid stand of eelgrass in healthy condition which occupied all available space suitable for growth. The stand was continuous in all subtidal sediments up to the mouth of an entering brook of fresh water. Even here scattered clumps were found growing in the mouth and several isolated plants were rooted well into the lower stretches of the brook. A continuous, thick ring of eelgrass wrack circled the cove. No significant change was noticed since last observed in 1949, when the maximum growth was reached for the first time since the advent of the epidemic. Only in this one cove, however, has eelgrass yet returned to its former status. The entrance channel to Goose Cove, on the west side of the causeway separating this cove from the main body of the Annisquam River, had about one-third of the subtidal sediments overgrown with eelgrass. Dense patches from 1-50 square yards were scattered about. The plants were bright green and appeared healthy. In two years time the total area covered here has increased from about one-quarter to approximately one-third of the channel bottom.

At nearby Lobster Cove a single, detached eelgrass plant was found at the water's edge during low tide. There was even a dearth of floating and stranded fragments in this cove. Another side-arm of the Annisquam River, known as Mill River, yielded but a single seedling and one small rhizome just sprouting a leaf along the spring-low-water line of the channel. Several fragments of dried leaves were found on the exposed channel bottom and along the shoreline. Since Mill River receives the discharge of fresh water from the Babson Reservoir through Alewife Brook, producing brackish conditions similar to those in Goose Cove, it is difficult to understand why eelgrass did not persist longer in Mill River and why it does not return as it has in Goose Cove.

In the main course of the Annisquam tidal waterway four small patches were found as follows: In a small channel between a sand bar and Merchant's Island two patches, one about two square feet and the other some three square feet, were found. Several isolated plants were scattered about the margins of these patches. The Merchant family has destroyed some of the growth which has become reestablished here for fear that it will again become a menace to swimmers as it once was. Across the river from Merchant's Island, near the point of Riverview, was found one small patch only four to five square inches in area. In the upper end of the Annisquam, known as Little River, another single patch of about two square feet was located on the north side of Stanwood Point. A survey of nearly the entire shoreline of the Annisquam did not disclose any other occurrence of eelgrass. Occasional fragments were found drifting or widely scattered along the shoreline, but there was no indication of any significant growth anywhere.

Waters surrounding Cape Ann, with the exception of the Annisquam tidal inlet, were not investigated from a boat. However, shoreline observations at low tide and a search for washed-in eelgrass wrack gave indications of very little growth of eelgrass on the ocean shores of Cape Ann. The rocky shores and sandy beaches of Gloucester Harbor and the adjacent ledges as far south as Magnolia Point were examined, but in general only a small number of scattered fragments were found. Along Pavilion Beach on either side of the southern entrance to the Annisquam inlet, eelgrass fragments were more plentiful than elsewhere. Here the fragments formed a rather continuous but thin line along the drift line and were rather commonly scattered over the beach. Around the ocean shores of Cape Ann examinations were made at High Popples, Bass Rocks, Good Harbor Beach, Salt Island, Land's End, Loblolly Cove, Back Beach (Rockport), Folly Cove, Lanesville Harbor, Plum Cove Beach, and Hodgins Cove (Bay View). In these places only a small number of isolated fragments were found, much less common than in Gloucester Harbor. In some places none was found.

In Ipswich Bay and Annisquam Harbor at the northern extremity of the Annisquam River, many floating fragments of eelgrass were observed. Much of this may have come from Goose Cove. On the adjacent shores of Wingaersheek Beach, however, the growth of young eelgrass plants has made considerable progress over two years' time. During a minus tide many small clumps of young eelgrass plants were found on the sand near spring-low-water line. They averaged six to twelve square inches in area and averaged about 20 feet apart. Some, however, were as close as three to four feet apart. Many of the plants were not healthy in appearance.

Leaves were often discolored and many blades were broken. Few leaves were over one foot in length. Nevertheless, the growth represents a considerable advance over conditions in 1949, although not yet of much importance.

As a boy living on the shores of Cape Ann, the writer was constantly reminded to stay out of eelgrass beds while in swimming. The almost complete disappearance of the eelgrass over the past twenty years was forcibly realized when he discovered that boys he met while searching the shores of Cape Ann had never heard of eelgrass.

It is a pleasure to acknowledge the assistance of Charles T. Herberle and Dr. William A. Beardslee in carrying out the 1951 survey.

KENT STATE UNIVERSITY, KENT, OHIO

NEW OR UNUSUAL RECORDS ON PLANT DISEASES

CLUBROOT OF CRUCIFERS IN FLORIDA

By W. B. Tisdale

Late in August specimens of Florida Broadleaf mustard were brought in from Marion County which showed enlargements on the roots that were not typical of rootknot. Microscopical examination revealed that the trouble was clubroot (Plasmodiophora brassicae Wor.). Although cabbage has been grown in that area of the county for years, no signs of clubroot have ever been reported by the growers. Furthermore, so far as the literature has been reviewed no report of its occurrence in Florida was found. A survey of the field involved revealed no definite source of infestation of the soil.

The land was high hammock that was cleared of heavy hardwood trees in the winter of 1950-1951, and had never been cultivated previously. The trees were removed with a bulldozer and pushed into heaps and burned. This operation left an uneven surface that was variable in texture and pH reaction.

Natural topography of the land was somewhat rolling and at least some of the low areas had received drainage water from a nearby field that had been under cultivation for many years. Soil reaction averaged pH 5.5 in these low areas and pH 7.0 on the higher areas and places where the trees were burned.

Florida Broadleaf mustard and Shogoin turnip (foliage turnip) were planted during the summer and most of the crops had been harvested when the trouble was reported. The mustard was planted on the lower portions of the field and the turnip on the higher portion. All of the area planted to turnip, except a few rows adjacent to the mustard, had been turned under. A high percentage of the remaining plants examined, both mustard and turnip, showed signs of infection, but no information was available on the condition of the plants that had been removed for sale.

Although the adjacent farm had been in cultivation for many years, information obtained indicated that cabbage had never been grown on it on a commercial scale, and that the plants grown for home use were not introduced from other States.

FLORIDA AGRICULTURAL EXPERIMENT STATION, GAINESVILLE.

RESISTANCE OF STRAINS OF CALIFORNIA WONDER PEPPER TO PHYTOPHTHORA ROOT ROT

By Paul G. Smith and P. A. Minges

Early in 1951 several strains of mosaic-resistant peppers of the California Wonder type were obtained from the breeding department of a canning company for trial. These were planted in the Merced area of California where root rot caused by Phytophthora capsici at times has been very troublesome.

The plants were set out in early April, and by June 15, out of 479 plants of the mosaic-resistant lots, 42 percent were visibly infected with root rot. Of 100 plants of the growers' variety, Oakview Wonder, none showed any symptoms, and 96 plants of a mosaic-susceptible commercial strain of California Wonder included in the plot were all healthy. Since the rows of Oakview Wonder alternated with the varieties under trial, and infection in the latter was quite uniform, there was little chance of escape. A duplicate plot of the same varieties in another field showed similar results. The plots were inspected again three weeks later, after picking had begun, and symptoms of root rot were still confined to the mosaic-resistant strains.

Although these observations were made incidental to the main purpose of the plot, they show that there is a marked difference in Phytophthora susceptibility in peppers. The resistance of the uninfected varieties is probably accidental, but may be sufficient for breeding for resistance. It seems likely than an even higher degree of resistance, if needed, could be found by a systematic search.

DIVISION OF TRUCK CROPS, UNIVERSITY OF CALIFORNIA, DAVIS

DISEASES OF SOYBEANS NEW TO MINNESOTA

By M. F. Kernkamp and J. W. Gibler

Brown stem rot of soybeans, caused by Cephalosporium gregatum Allington & Chamberlain, was found for the first time in Minnesota in September 1951. The disease was first seen in the soybean disease nursery on the Minnesota Agricultural Experiment Station Farm, St. Paul, and

several days later diseased plants were found in Freeborn County. Specimens were sent to the Regional Soybean Laboratory, Urbana, Illinois, for identification, and the authors wish to express their thanks to Dr. D. W. Chamberlain for his assistance in identifying the disease.

Stem canker, caused by Diaporthe phaseolorum (Cke. & Ell.) Sacc. var. batatatis, was found for the first time in Waseca, Freeborn, Faribault, and Blue Earth Counties in Southern Minnesota in September 1951. Heretofore, the disease had been reported in Northern Iowa by Dr. J. M. Crall.[1] Specimens were sent to Dr. Crall for identification, and the writers wish to express their appreciation for his assistance in that respect.

MINNESOTA AGRICULTURAL EXPERIMENT STATION, ST. PAUL, MINNESOTA; IN COOPERATION WITH THE DIVISION OF FORAGE CROPS AND DISEASES, U. S. BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING

[1]Crall, J. M. 1950. Soybean diseases in Iowa in 1949. Plant Dis. Reptr. 34:96-97.

PEACH ROSETTE IN ARKANSAS

By Curtis L. Mason

In June 1951 this department received for identification a diseased peach twig collected by Mr. Milton Scott, Assistant County Agent of Boone County, in a small home orchard near Harrison, Arkansas. The specimen was typical of peach rosette. Since this was the first report of peach rosette in this section of Arkansas[1], a survey was made to determine the extent of the disease. The orchard consisted of approximately 20 trees between 12 and 15 years old, most of which were severely diseased, and 8 trees that are three years old. Since this is the first year in which symptoms were observed and since the young trees were also severely affected, it is apparent that the disease was transmitted through the nursery stock. The young trees were obtained from a transient salesman of unknown identity. Fortunately the orchard is well isolated from other orchards in the area and inspection of the nearest orchard (approximately three miles away) revealed no symptoms of rosette. The infected trees were destroyed and the area will be watched for any further development of this disease

DEPARTMENT OF PLANT PATHOLOGY, UNIVERSITY OF ARKANSAS, FAYETTEVILLE, ARKANSAS

[1]Two isolated cases of rosette have been found in other sections of the State.

DOWNY MILDEW OF OATS FOUND IN ARKANSAS, MISSISSIPPI, AND GEORGIA IN 1951

By Thomas E. Summers, C. Roy Adair, and T. R. Stanton

Downy mildew of oats (Sclerospora macrospora) was observed in Arkansas, Mississippi, and Georgia in 1951. This disease has been noted in Taggart oats at the Rice Branch Station, Stuttgart, Arkansas, for several years. It perhaps was less prevalent than usual in 1951. A small bundle of infected plants, however, was collected in a few minutes in an increase plot of Taggart oats on the Rice Branch Station.

D. H. Bowman, grain specialist, located at the Delta Branch Station, Stoneville, Mississippi, found downy mildew-infected plants in nursery rows of Delair, a sister reselection of Taggart, at Stoneville, in May 1951. The identification of the disease in Delair was confirmed by the junior writer when plants were brought to his attention at that time.

Downy mildew was found by the senior writer in May 1951 in a field of oats north of West Point, Mississippi. In all probability these oats were of the Delair variety.

Downy mildew also was found by the senior writer in a field of an unnamed strain of Red Rustproof oats in Coweta County, Georgia, in April 1951. This apparently is the first instance of downy mildew found in Red Rustproof oats. The oospore size varied considerably from that of spores found in plant tissue collected at other locations. During the last few years this disease has been found in several varietal types of oats. It seems to occur most frequently in Bond-derived varieties such as Delair and Taggart and in Victoria derivatives such as Traveler, Letoria, and Stanton.

DIVISION OF CEREAL CROPS AND DISEASES, U. S. DEPARTMENT OF AGRICULTURE

RECORDS OF ROSE ANTHRACNOSE IN RHODE ISLAND

By Anna E. Jenkins

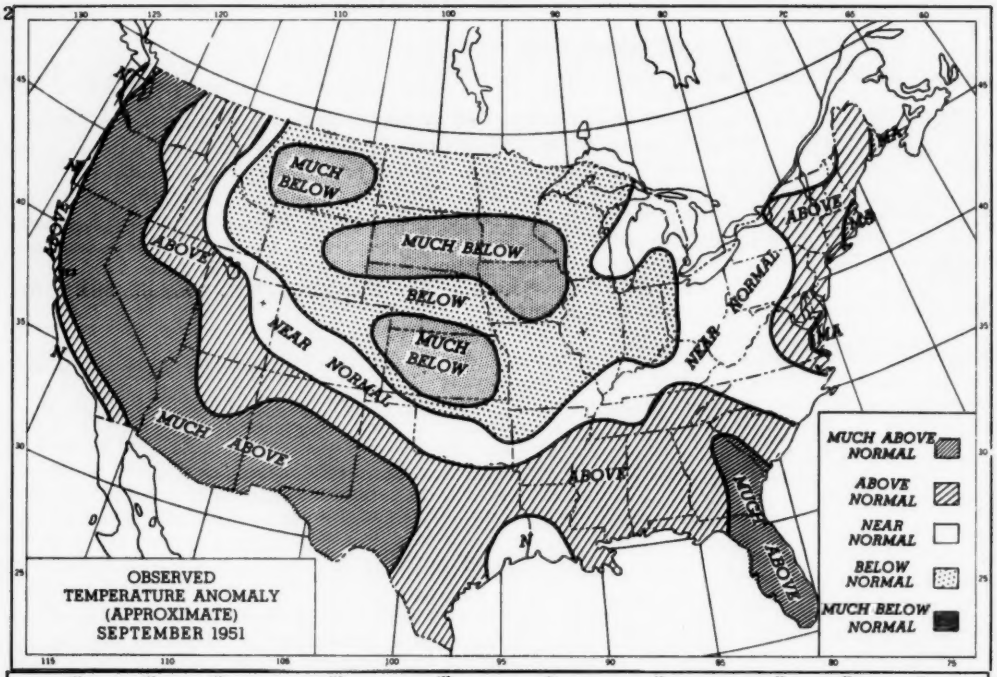
On the distribution map of spot anthracnoses that by March 1947 were known in the United States[1] Rhode Island is conspicuous as the only State east of the Mississippi River without record of one of these diseases. In October, however, S. I. Cohen[2] reported rose anthracnose (Sphaceloma rosarum) from nine different nurseries. These were in Kent, Newport, Washington, and Providence Counties, as he later wrote (May 10, 1948), adding "Rose anthracnose has been reported in 1946 nursery survey records by my predecessor Dr. Harry L. Keil." The specimen contributed by Dr. Cohen is from Carolina, Washington County, September 8, 1948.

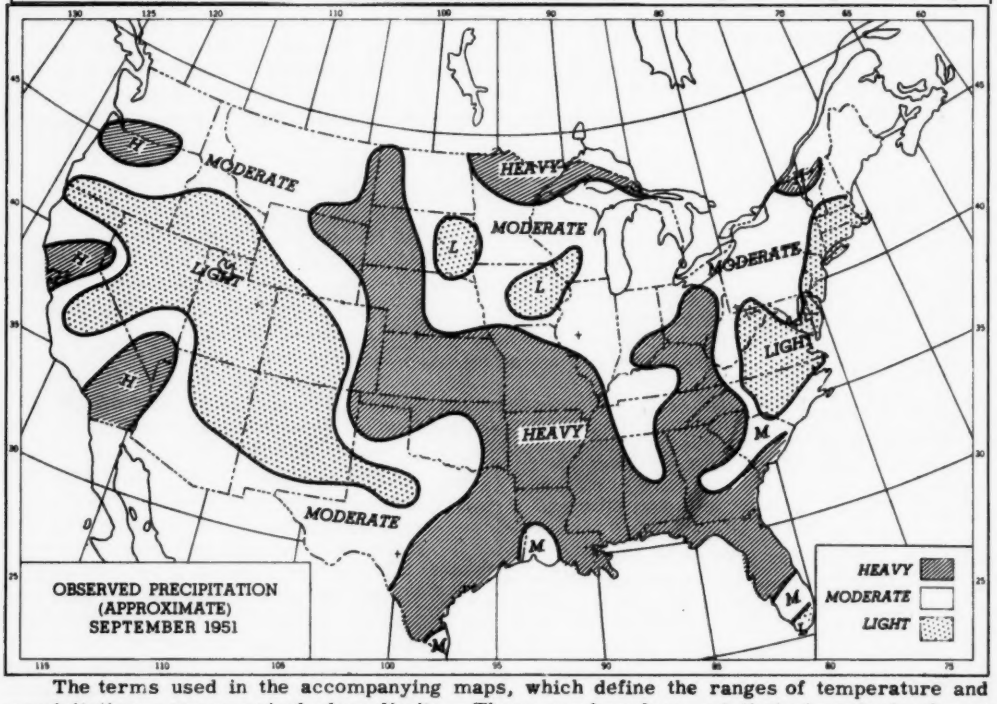
MYCOLOGY AND DISEASE SURVEY, BUREAU OF PLANT INDUSTRY, SOILS, AND AGRICULTURAL ENGINEERING, BELTSVILLE, MD.

[1]Jenkins, Anna E. and Bitancourt, A. A. Spot anthracnoses in the United States and some island possessions. Plant Dis. Reptr. 31:114-117, illus. (map) 1947.
[2]Cohen, S. I. Incidence of diseases in Rhode Island Nurseries in 1947. Plant Dis. Reptr. 31:394-396. 1947.

A CORRECTION

Reference to the occurrence of Sphaceloma sp. on soybean (Glycine max) collected in Franklin County, Pennsylvania, in the year 1943, and recorded in Plant Disease Reporter Supplement 147 on page 155, should be deleted. It was included in the summary concerned only through an oversight. The diseased specimen of soybean was insufficient to determine the identity of the involved pathogen and was not preserved. In 1943 Sphaceloma was not known on soybean, but it has since been found causing a destructive disease of this crop in Japan. (Jenkins, Anna E. Sphaceloma scab, a new disease of soybean discovered by plant pathologists in Japan. PDR 35: 110-111. 1951.) -- L. J. Tyler, Department of Plant Pathology, Cornell University, Ithaca, New York.





The terms used in the accompanying maps, which define the ranges of temperature and precipitation, are numerical class limits. These are based on a statistical analysis of past records through which is determined the normal frequency of occurrence of temperatures and precipitation at various times of the year for different locations. For temperature the classes above, below, and near normal are so defined that they each normally occur one-fourth of the time; much above and much below normal, one-eighth of the time. Precipitation is depicted in terms of light, moderate, and heavy, each class normally occurring one-third of the time and thereby having equal probability of occurrence. These maps graphically represent only the general trends and give the country's weather picture at a glance. For quantitative studies, where monthly mean temperatures and actual precipitation records are needed for a given time and place, other publications of the Weather Bureau should be consulted. P. R. M.